

TECHNICAL REPORT NO. 318

COPPERHEAD OPERATIONAL PERFORMANCE EVALUATION (COPE):

COMPUTER PROGRAM USER AND ANALYST MANUAL

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U. S. ARMY MATERIEL SYSTEMS ANALYSIS ACTIVITY ABERDEEN PROVING GROUND, MARYLAND

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PREFACE

This report documents the COPE methodology and computer programs.

Various sections of this report are aimed at different audiences:

Chapter 1 is an introduction to COPE and to this report.

Chapters 2 and 3 are intended for the analyst who is concerned with the modeling methodology and assumptions.

Chapters 4, 5, 6, 7, 14, 15, and 16 are aimed at the user who wants to use the COPE model and its preprocessors in production runs, but who is not interested in programming details.

Chapters 8, 9, 10, 11, 12, and 13 are intended for the programmer who wants a thorough understanding of the COPE computer code in order to implement it on other machines or simply to make changes to it.

The first four appendixes (A, B, C, and D) include program listings and sample cases. The sample cases are cumulative in the sense that the three PAM sample input sets should be run using respectively the three PAM sample runstreams before running the PREPMS program. The sample PREPMS case should then be run using the TAPE 11 created by the PAM runs (this will result in the output of Appendix C). Finally, the COPE sample case should be run using the TAPE 11 created by PAM and PREPMS (this should result in the output of Appendix D). Running these sample cases and comparing the results with those in the appendixes provide a check for correct implementation of COPE and its preprocessors on other machines.

If discrepancies are found in this publication or the associated software, please send notice to:

Director
US Army Materiel Systems Analysis Activity
ATTN: DRXSY-GS (Mr. R. Sandmeyer)
Aberdeen Proving Ground, MD 21005

Suggestions for improvements to this report or the associated programs may also be sent to the above address.

In addition, requests for magnetic tape copies of the COPE programs and related files should be sent to the same address along with the appropriate paperwork for such requests.

This report may be updated by the issuing of revised pages. The frequency of such updates will, of course, depend on the number of errors requiring correction, the changes made in the model, and the demand for the report. Those desiring to maintain the latest versions of the report and the programs should be certain that they are on the COPE distribution list to be maintained by AMSAA.

NOTE ON CLASSIFICATION

This report is unclassified, however, when the COPE model is used for actual production runs, it requires some classified inputs. The inputs used in the sample cases (see Appendixes) are correct data except for false values which have been inserted in place of those data whose correct values are classified.

In addition, comment cards with the characters "CSEC" in columns 1-4 point out places in the program code where fictitious constants have been substituted to replace classified values in the listings of PAM and COPE (Listings A-1 and D-1).

The following data are classified (at the time of publication of this report) when correct values are used and identified as such:

In the PAM program: ETH, THEMH, and DISMH are classified by Reference 1 below. ED is classified by Reference 2.

In PREPMS and COPE programs, the values of PE, RNGTTF, and PKTBL, as well as the true seeker sensitivity value, are all classified by Reference 1.

¹Security Classification Guide, <u>Projectile</u>, 155mm, Cannon Launched, <u>Guided</u>, XM712, (CLGP), dated 24 July 1979.

²Security Classification Guide, <u>Ground Laser Designators</u>, dated 16 June 1978.

ACKNOWLEDGEMENTS

The COPE model was developed by the Support Weapons Analysis Branch (SWAB) of the Ground Warfare Division (GWD) of the US Army Materiel Systems Analysis Activity (AMSAA).

The requirement to create such a model came from David Hardison, Deputy Under Secretary of the Army for Operations Research (DUSA-OR). A preliminary model proposal was put forward by Herbert Fallin of the Office of DUSA-OR.

When AMSAA received the requirement and proposed model, a team of four analysts of the System Evaluation Section of SWAB was established to develop the model, oversee the collection of data, and, as it turned out, participate in the COPPERHEAD COEA by doing production runs and writing up the results. This team consisted of the section chief, Richard Scungio, who served as team leader and overall coordinator, Julian Chernick, Michael Starks, and the author of the present report, Richard Sandmeyer. Much of the design of the COPE model was accomplished by discussion within the team and individual credit cannot easily be assigned. However, COPE drew heavily on the probability of engagement work done previously by Mr. Chernick and Mr. Starks (see bibliography) including the modeling of weather; the PAM program written by Michael Starks was a derivative of a program used in that earlier work. Mr. Sandmeyer converted the conceptual COPE model into a working computer program (COPE) and also wrote the remaining two programs of this report (PREPMS and PRBLOS).

This report is, of course, concerned with the COPE model and its implementation as a computer program, but a word of appreciation to those who helped gather data for COPE is appropriate here even though this report does not deal with the data collection process (for the data sources used, see COPPERHEAD COEA in bibliography). Data for use in COPE was gathered by David Barnhart, Diana Frederick, Annie Young, and Edward Stauch (all of SWAB). In addition, David Kilminster of SWAB had previously assisted Mr. Chernick and Mr. Starks in obtaining and using weather data. Charles Cairns of AMSAA supplied LDWSS probability of hit numbers and MAJ Charles Williams of FT Sill, OK, provided advice and served as liaison between AMSAA and FT Sill. The SMOKE data was obtained from Sid Gerard (then of AMSAA, now of PM, SMOKE).

Special thanks is given to Mrs. Robin DeFranks, who edited and typed this lengthy report. Thanks also to Mary Webb of SWAB who typed the text in the flow charts of Chapter 11.

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CHAPTER 1

INTRODUCTION

1.1 COPE Background.

Traditionally the item level performance of a weapon system has been expressed in terms of the firepower characteristics of the weapon. The weapon characteristics normally included in the computation of firepower were range, accuracy, lethality, and rate-of-fire. With the introduction of more sophisticated weapons, an awareness of the need to include additional factors in the assessment of a weapon's performance has emerged at both the decision and R&D levels. These additional factors have collectively been referred to as the "Battlefield Environment" and include natural phenomena as well as conditions imposed on the system by friendly and enemy forces.

The need for quantifying a weapon system's performance within the battlefield environment recently became most critical with the development of the 155mm XM712 COPPERHEAD artillery projectile. To study its potentially degraded performance under some battlefield environments, AMSAA developed a computer model which is known by the acronym COPE (COPPERHEAD Operational Performance Evaluation).

In addition to being a model for assessing the performance of a weapon system, the model and the manner of generating the input requirements constitute a novel approach to the evaluation of weapon systems. This approach results in a manner of assessing the performance of most weapon systems and potentially can quantitatively produce insight into the performance of one or more weapon systems which previously could only be treated subjectively.

This report describes the COPE model as currently used at AMSAA for the assessment of COPPERHEAD. AMSAA has modified the computer code to obtain models that analyze the performance of other weapon systems within the context of a COPE type "operational performance" analysis. The term COPE itself has now come to have two meanings: (1) "Combat Operational Performance Evaluation" which is the generic name for all of the derivative models of the original COPPERHEAD version and (2) "COPPERHEAD Operational Performance Evaluation" which is the first model in this family of "Operational Performance" models and is the one described in this report.

The models in the COPE family include:

- (1) <u>COPPERHEAD Operational Performance Evaluation (COPE)</u> used to evaluate the XM712 COPPERHEAD artillery round,
- (2) <u>Tank Performance Evaluator (TAPE)</u> used as part of the XMI tank evaluation,
- (3) TOW Operational Performance Evaluator (TOPE) used to evaluate the TOW anti-tank missile,

- (4) SADARM Operational Performance Evaluator (SOPE) used to evaluate the proposed SADARM artillery round,
- (5) <u>Top Attack Evaluation Model (TAEM)</u> used to evaluate candidates in the Top Attack Study,
- (6) Ground Launched HELLFIRE Operational Performance Evaluation (GLHOPE) used to evaluate ground launched HELLFIRE,
- (7) $\underline{\text{RPVCOPE}}$ used to evaluate COPPERHEAD when designation was performed by an RPV, and,
- (8) <u>HELLFIRE Operational Performance Evaluation (HOPE)</u> used to evaluate HELLFIRE launched from helicopters.

The input requirements for these models range from moderate to massive. The TAPE and TOPE models for example require no preprocessors and take less input than the COPPERHEAD version. The TAEM program, on the other hand, requires as input results generated by the very costly, long running, TGSM (Terminally Guided Submunition Model) program.

This report is concerned only with the COPE model (in all remaining sections of this report, COPE shall have its second, narrower meaning: "COPPERHEAD Operational Performance Evaluation"); however, much of what is discussed applies to the other models in the family. Any of the models of the COPE family can be obtained from AMSAA, though at the present time only the COPPERHEAD and tank versions have been extensively documented.

1.2 Overview of COPE Computer Programs.

There are actually four computer programs used in the COPPERHEAD Operational Performance Evaluation. They are:

- (1) The main COPE program (formerly called SLATCH for Simple Look at the COPPERHEAD) descended from the original proposal put forward by DUSA-OR.
- (2) The PAM (Probability of Seeker Acquisition and Round Maneuver) model used to create the probability of engagement tables used as input to the main COPE program. This model is described and documented more thoroughly in a forthcoming AMSAA technical report.
- (3) The PREPMS (<u>Preprocessor Mass Storage</u>) program that is used to create and modify the word addressable mass storage file used as the COPE "data base".
- (4) The PRBLOS ($\underline{Probability}$ of $\underline{Line-of-Sight}$) model used to obtain the probability of having $\overline{line-of-sight}$ for the terminal phase of the COPPERHEAD trajectory.

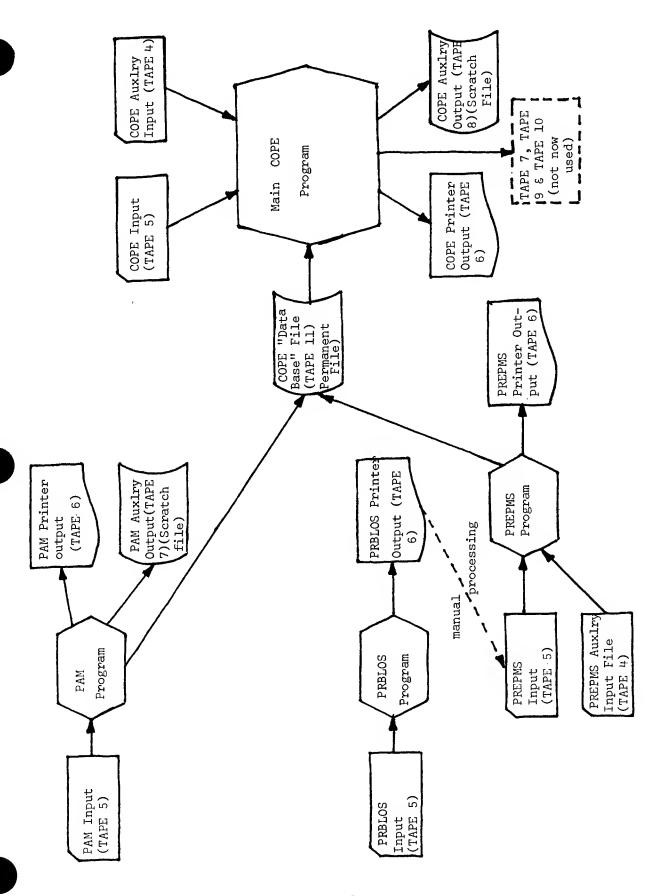


FIGURE 1-1 COPE And Its Preprocessors

All four of these programs are documented in this report, though the PAM model is covered in much less detail than the other three since a more detailed treatment of it will be published in a separate report.

The relationships among the four programs and the word addressable "data base" file are shown in Figure 1-1.

The major data sets (called "data blocks" later in this report) are put on the data base by PAM and PREPMS. Then when one wishes to run COPE, it is necessary only to submit a string of simple input commands describing the cases to be run. For example, when running a case using December weather for 0600 (6 a.m.), one need merely submit a card: WEATHER, DECEMBER, 0600 rather than read in thirty or forty cards filled with the appropriate weather data. This arrangement makes it extremely simple to run many cases of COPE with relatively few input cards once the data base file has been created.

In the event that one wishes to run cases that use a data set not on the data base file, there is a "temporary" option that allows one to read the data into COPE directly; however, if one intends to run multiple cases with such data, it will be easier in the long run to read it onto the permanent data base file once using the PREPMS program and then "call it up" for use as necessary in COPE by submitting the appropriate single card command.

All four programs are written in CDC FORTRAN Extended Version 4.

CHAPTER 2

DESCRIPTION OF COPPERHEAD MISSION MODELING

2.1 Application Area of Simulation.

The main COPE program is a simulation of a COPPERHEAD fire mission under battlefield conditions. It takes into account such degrading effects on designator, fire direction center (FDC), artillery battery, and COPPERHEAD round performance as meteorological conditions, terrain shielding, smoke, dust, enemy artillery preparatory fires, enemy direct fire against the designator, communication failures, and target location error as well as numerous factors that affect COPPERHEAD's ability to engage and hit a target.

The main COPE program was designed to evaluate the operational performance of the overall COPPERHEAD system under battle-field conditions.

The output of the program enables one to see which factors contribute most to the degrading of COPPERHEAD system performance and which are, therefore, areas in which performance improvement efforts should be concentrated.

In addition, by varying the input value(s) associated with a particular factor and then studying the results, one can perform the customary sensitivity analysis. A series of such analyses can be expected to show that changes (within realistic limits) in some factors have little effect on overall system operational performance whereas changes in other factors will result in major performance improvement or degradation.

By comparing those factors to which system operational effectiveness is most sensitive with those factors over which system designers and tacticians have some control, one can determine what, if any, design changes or employment doctrine changes might be made to improve overall COPPERHEAD system operational performance. This comparison and analysis, of course, is done outside the COPE program, but the resulting modified COPPERHEAD system and employment doctrine might then be evaluated in the COPE model or a descendent of it.

Finally, several derivative models have been developed from an earlier COPE program (SLATCH version 3.2) and are in use for evaluating tanks, TOW, and Hellfire under battlefield conditions. These models allow limited but informative comparisons of the operational performance of the different weapon systems.

2.2 Description of Model.

2.2.1. Outline of COPPERHEAD Mission. The heart of the main COPE program is the Monte Carlo simulation of a potential COPPERHEAD fire mission. This simulation consists of a series of steps that would occur in an actual COPPERHEAD fire mission. For a successful mission, these steps start with the unmasking from terrain shielding of a target and end with the killing of a target by COPPERHEAD. For an unsuccessful mission, the steps end before the target is killed.

The steps are grouped into three series bounded by four major events. The following outline gives the four major events as well as the steps (or tests) that must be passed to reach the next major event. All steps and events occur in the order listed.

This describes the tests when the so-called "shooting gallery" line-of-sight model is used. Following the list is a description of the modifications required when the "random occurrence" line-of-sight model is used.

- Event 1. A target (one or more target vehicles) unmasks (i.e., enters a region within line-of-sight of the designator operator's position). This is termed an "occasion" and begins the simulation of the potential COPPERHEAD mission.
- Test 1: Has the designator operator survived enemy preparatory artillery fires up to the present time?
- Test 2: Is the target within the meteorological visibility range limit of the designator operator for the present weather conditions?
- Test 3: Is the target within the designation range of the laser designator system being played?
- Test 4: Did the designator operator detect/acquire the $t \frac{d}{d} r g e t$ before it again became masked by terrain?
- Test 5: Is the line-of-sight from designator-to-target sufficiently free of smoke that the designator operator can see and designate the target?
- Test 6: Is the line-of-sight from designator-to-target sufficiently free from dust for the designator operator (D.O.) to see and designate the target?
- Test 7: Is the target sufficiently far away from the designator operator that he will stay and designate rather than "bail-out?"

- Event 2: The designator operator has acquired a target and decides to engage it (i.e., call for COPPERHEAD fire against it). This is termed an "attemped engagement."
- Test 8: Is the designator operator able to communicate with the fire direction center (FDC)?
- Test 9: Does the message which the designator operator sends to the fire direction center contain the correct information and does the FDC interpret it correctly?
- Test 10: Is the target still (after time has been spent on communication and preparing to fire the mission) sufficiently far away that the designator operator will stay and designate rather than "bail-out?"
- Test 11: Does the designator operator still have line-of-sight to the target?
- If tests 8 through 11 are all passed, then conditions are such that a COPPERHEAD fire mission occurs. This leads to:
 - Event 3: The battery is ready to fire and the designator is ready to designate. A COPPERHEAD round is fired. This is termed a "shot".
 - Test 12: Does the designator operator still have lineof-sight to the target during the final critical time interval of the COPPERHEAD trajectory?
 - Test 13: Has the designator operator been warned to begin lasing the target or has he seen the first COPPERHEAD round of this fire mission already impact?
 - Test 14: Does the designator survive direct fire from the target being designated and is the line-of-sight to the target unobscured by direct fire rounds landing in front of the designator?
 - Test 15: Is the COPPERHEAD round just fired reliable?
 - Test 16: Is the line-of-sight from the designator operator to the target vehicle unobscured by small terrain features?
 - Test 17: Does the round come sufficiently close to the target for the seeker to receive enough reflected laser energy to engage the target and is the target within the maneuver footprint of the COPPERHEAD?

Test 18: Does the COPPERHEAD round hit the target?

Test 19: Does the COPPERHEAD round kill the target?

If tests 12 through 19 are all passed, then we have:

Event 4: The target vehicle is killed. This is termed a "kill."

If more COPPERHEAD rounds are to be fired for this mission, the model time is moved ahead to account for the time between rounds, and the model resumes at Event 3 for the next COPPERHEAD round.

To model the "random occurrence" line-of-sight case, tests 4 and 11 are not made and test 12 uses a different assumption.

The two ways of handling the line-of-sight problem are called the "shooting gallery" method and the "random occurrence" method.

The "shooting gallery" method assumes that the entire COPPERHEAD mission must be completed during the time interval starting with the first target vehicle entering line-of-sight segment and ending with the last vehicle of the target leaving that same line-of-sight segment (see Figure 2-1).

The "random occurrence" method on the other hand assumes that target vehicles are passing in and out of view. Instead of assuming that all rounds fired after the last target vehicle leaves the line-of-sight segment in which it was acquired are wasted as in the "shooting gallery" technique, the "random occurrence" method does not check loss of line-of-sight until the last critical seconds of the COPPERHEAD trajectory and even then the check allows for the possibility that a target may have left the first line-of-sight segment but entered a second (or subsequent) line-of-sight segment where COPPERHEAD can be used. The "random occurrence" line-of-sight model, then merely checks whether there is at least one unkilled target vehicle that will be within line-of-sight of the designator for the final critical seconds of the COPPERHEAD trajectory (see Figure 2-2).

Now each step (test) in the model is explained in detail:

2.2.2 Preparatory Fires. The first test encountered by a potential COPPERHEAD mission is for designator operator survivability of preparatory fire. A probability that the designator operator is killed by enemy preparatory artillery is input (either explicitly or by default) and for each replication (i.e., each sample potential COPPERHEAD mission) of the given case, a uniformly distributed (pseudo-) random number is drawn. If that random number is less than the input probability that the designator operator is killed by enemy preparatory artillery fire, then the potential COPPERHEAD

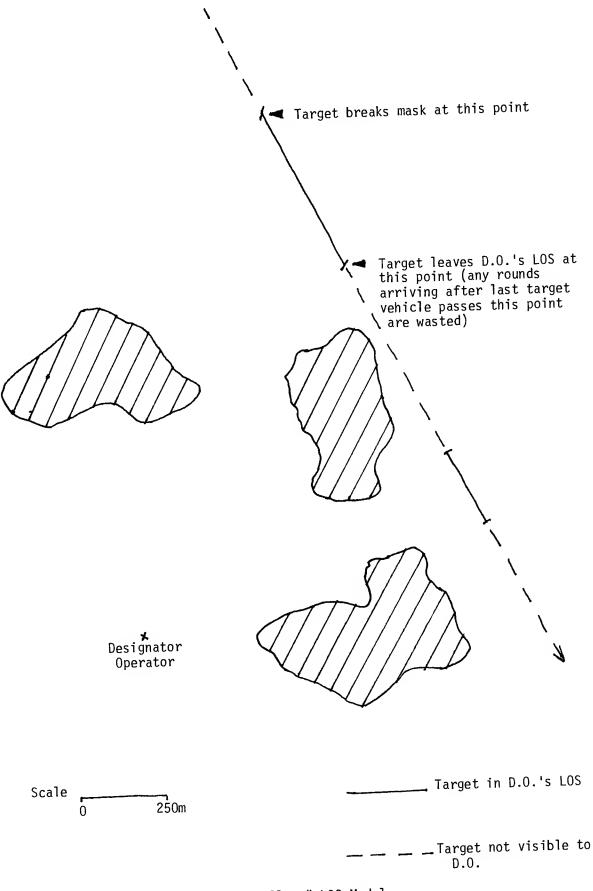


FIGURE 2-1 "Shooting Gallery" LOS Model

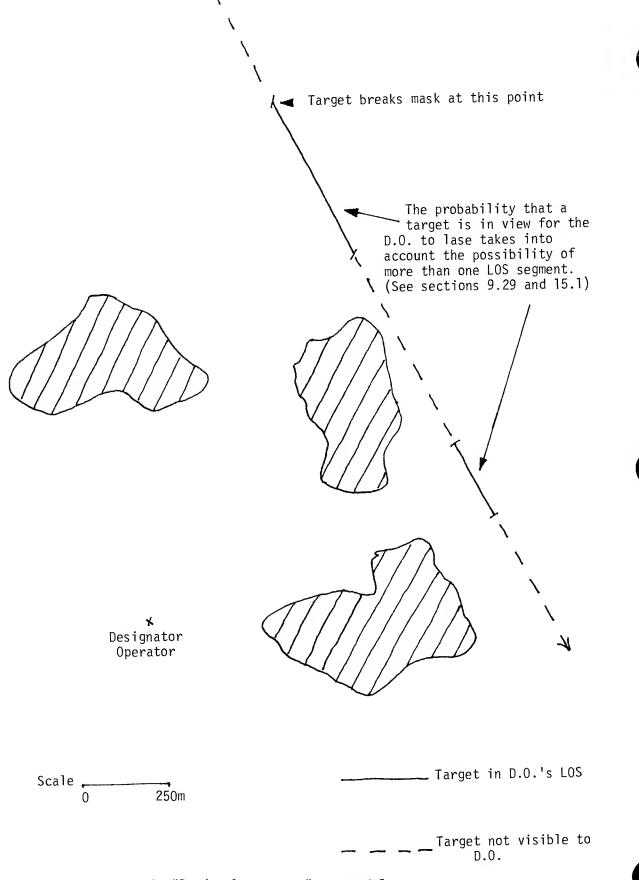


FIGURE 2-2 "Random Occurrence" LOS Model

mission aborts because the designator operator is killed; otherwise, the potential COPPERHEAD mission continues to the next test.

2.2.3 Visibility Range. The next test depends on the weather conditions. For the month and time of day that is used for a given case, there is a distribution of weather conditions which includes the probabilities of various cloud ceiling altitude and meteorological visibility range combinations as well as probabilities of various Pasquill atmospheric stability categories, windspeeds, and relative humidities. For each replication of a given case, the cloud ceiling altitude and meteorological visibility range distribution is sampled and the results (cloud ceiling altitude and meteorological visibility limit (range)) obtained are recorded for later use.

The program then samples the acquisition range distribution once for each replication to obtain the range from designator-operator (D.O.) to target terrain unmask for the current replication. If the target unmasks from terrain shielding at a range from the designator-operator beyond the current replication's meteorological visibility limit, then the potential COPPERHEAD mission is aborted since the target cannot be seen and, therefore, cannot be lased by the designator operator; if, on the other hand, the target unmasks at a range less than the visibility limit, then the next test is made.

2.2.4 Designator Maximum Range. Using the above random sample from the acquisition (terrain unmask) range distribution, the next test compares the designator-to-target range with the maximum designator range. If the target is beyond the maximum designation range, then the potential COPPERHEAD fire mission is aborted; otherwise, the tests continue.

At night, the maximum designator range is reduced to the range to which the thermal imagery night sight is usable for aiming the designator.

2.2.5 Target Not Detected. The next test is performed to determine whether the target was in view long enough to be acquired (the entire detection, recognition identification process is lumped into one test and called detection).

After a range from designator-operator to target terrain unmask is obtained as above, a line-of-sight segment length distribution is sampled to obtain the length of the section of the target's path extending from the point of initial terrain unmask to the first point along the path that is obscured from the D.O.'s view. From this line-of-sight segment length together with the target velocity and length of the target unit column, the duration of line-of-sight is calculated. This duration is the time from initial target unmask until the last vehicle in the target unit's column passes out of the D.O.'s view.

To determine whether the target is detected, a time is sampled from a distribution of detection times. This time represents the delay from the time of initial target unmask until the D.O. has detected, recognized, and identified the target and decided to call for COPPERHEAD fire. This is termed detection time.

If the detection time is greater than the duration of the line-of-sight on a particular replication, then the target is considered to have gone in and then out of view before the D.O. could detect it (or really before he could call for fire against it) and the mission aborts. If the detection time is less than the line-of-sight duration, then the D.O. detects and calls for fire on the target before it leaves his line-of-sight and the model continues to the next test.

 $2.2.6\,$ Smoke. The next test is to determine whether there is sufficient smoke in the area of the target to prevent the D.O. from either seeing or lasing the target. The smoke model computes the fraction of targets that could be obscured from view by taking into account such factors as number and type of RED smoke rounds fired and weather conditions for the month and time of day considered in the current case.

As an alternative to specifying a volume of RED smoke rounds which is then used to calculate the fraction of targets obscured, one can simply input a fractional value which represents the fraction of targets obscured by smoke.

In either case, the fraction of targets (actually fraction of a specified front width) obscured by smoke is played as a "probability of abort due to smoke." For each replication that reaches the smoke test, a random number is drawn from a uniform distribution (from 0 to 1) and if it is less than the probability of abort due to smoke, then the mission is aborted at this step; if it is greater than the probability of abort due to smoke, then the next test is performed.

Note that while the D.O. has a limited target detection capability in smoke by using a thermal site on the designator, the laser beam itself could not penetrate the smoke in those cases where smoke was thick enough to require use of a thermal site. Consequently, COPE plays a "black-white" smoke situation: either smoke completely aborts the mission or has no effect. This is not the case for some of the other COPE variants (such as TAPE, SOPE) where there are three possibilities: (1) smoke is not present and, hence has no effect, (2) smoke is present and kills mission, (3) smoke is present but target can still be detected through thermal site and target is engaged but with reduced accuracy.

2.2.7 Dust. The next test is whether the dust from RED HE artillery fire is sufficient to prevent the D.O. from either seeing the target or lasing it. This is modeled in a very simplistic way in the current generation of COPE.

A probability that dust aborts the mission is estimated outside the COPE program and then input for a given COPE case (either explicitly or by default). Then for each replication that reaches the dust test, a random number is drawn from a uniform distribution (0 to 1) and compared to the probability that dust aborts the mission. If the random number is less than the probability that dust aborts the mission, then the mission is aborted; otherwise, the next test is made.

2.2.8 Designator Bail-Out (Precommo). The next test is to check whether the target is so close to the D.O. that in order to survive he would not engage the target. The assumption is that to avoid being killed by direct fire from potential COPPERHEAD targets, the D.O. would move to a new position whenever the enemy front line units closed to within a certain range; in the case of an isolated lead enemy unit, he might merely refrain from designating rather than move, but in either case he would not be calling for COPPERHEAD fire.

To perform this test, the model compares the D.O.-to-target range against a pre-set "bail-out" range. If the D.O.-to-target range is less than the bail-out range, the mission aborts; otherwise, the mission proceeds to the next test.

Note that this bail-out check is made prior to the D.O.'s call for COPPERHEAD fire. A second bail-out check (see section 2.2.10) is made later.

<u>2.2.9</u> Commo-out (Tests 8 and 9). The next test determines whether the D.O. has a communication link with the F.D.C.

Communication delay time and probability of success (Test 8) can be played in any one of three ways depending on the input option selected:

- (1) A single response time distribution is used together with a single probability of having a good communications link. In this case, a number is randomly sampled from the response time distribution to determine the total delay time from the D.O.'s call for Copperhead fire until the firing battery is ready to pull the lanyard to fire Copperhead. In addition, a second random number is drawn, this time from a uniform (0 to 1) distribution; if this random number is less than the probability of having a good communication link, then the mission proceeds to the Test 9; otherwise, the mission is aborted.
- (2) The second way of playing communication delay time and probability of good communication link is called the "parameterized response time" option. This case is essentially the same as (1) above except that the delay time is set at a single fixed value that is the same for every replication (as opposed to sampling a distribution of delay times to obtain a new delay time value for each replication).

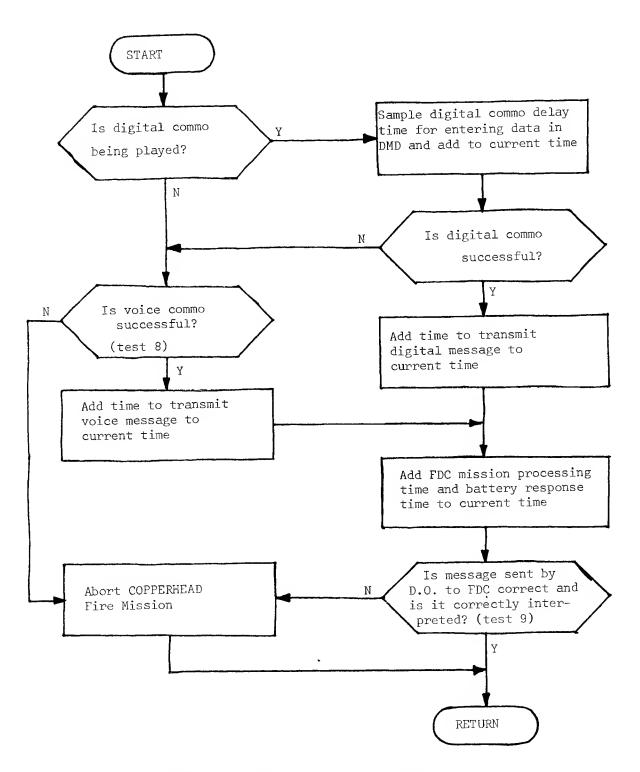


FIGURE 2-3 Third Communication Model

(3) The third way to model the communication delay time is to use a separate delay time for each part of the process from the D.O.'s calling in a fire mission to the battery's pulling the lanyard. Under this method, a delay time distribution is used to obtain digital communication times for D.O. to FDC messages. This delay time is a function of mission type and time of day (i.e., day or night).

The flowchart in Figure 2-3 gives the complete picture of the time delays when this third model is used.

No matter which of the three ways of modeling delay times is used, either communication fails and the mission aborts or communication is established and a delay time is added to the current time. Finally, if communication is established, another random number (uniform between 0 and 1) is drawn and compared to the probability of a successful (i.e., one containing the correct information) message (Test 9). If the random number is less than this probability, the mission proceeds to the next test; otherwise, the mission aborts because the message from the F.O. had bad data or was incorrectly interpreted.

- 2.2.10 Designator Bail-Out After Communication. After the communication from D.O. to FDC to firing battery is completed successfully, the D.O.-to-target distance is updated to account for target movement during the communication and processing delay. If the updated position brings the target within the "bailout" range of the D.O. (see 2.2.8) then the mission is aborted; otherwise, the mission continues with the next test.
- 2.2.11 Line-of-Sight Lost Prior to Firing. The next test is to determine whether the D.O. has lost LOS to the target. The current time (detection time plus communication and processing delay times) is compared to the duration of line-of-sight. If the current time is greater than the duration of line-of-sight, then the target has left the D.O.'s field of view prior to the firing of the first COPPERHEAD and the mission is aborted; otherwise, the mission is fired, the time of flight is added to the current time, and the next test is made.
- 2.2.12 Line-of-Sight Lost During Mission. The tests prior to this affected the entire mission; the sequence of tests after this point is performed separately for each round in the fire mission.

The current time (which is the time the first (next) COPPERHEAD round is to arrive) is compared to the duration of line-of-sight. If the current time is greater than the duration of line-of-sight, then the current round is aborted (ineffective); otherwise, the mission proceeds to the next test.

At the time the first COPPERHEAD round is fired for a given mission, a message is sent to the D.O. by the FDC telling him to begin lasing the target. To determine whether the D.O. receives this message, a random number is drawn from a uniform (0 to 1) distribution and compared to the probability of D.O. warned to lase. If the random number is less than the probability, then the message gets through, the D.O. lases, and the next test is performed; otherwise, the message does not get through, the D.O. fails to lase, and the first round is wasted (aborted).

Even if the message warning the D.O. to lase does not get through for the first COPPERHEAD round, the model assumes that the D.O. would see the first round impact and hence know to begin lasing for the second and subsequent rounds; therefore, rounds after the first round are never lost because of D.O.'s failure to lase.

2.2.14 Designator in Direct Fire. The next test determines whether the $0.0 \cdot$ is unable to lase due to incoming direct fire. It is assumed that the target being lased for the COPPERHEAD fire mission has a laser alarm as well as capability that allows it to locate the $0.0 \cdot$'s position (when his laser is on) with sufficient accuracy to fire.

A random number is drawn from a uniform (0 to 1) distribution and compared to probability of kill and probability of suppression values (which are a function of D.O.-to-target range). If the random number is less than the probability of kill, then the D.O. is considered killed and the current round and all subsequent rounds for this replication are aborted. If the random number is greater than the probability of kill but less than the sum of the probability of kill plus the probability of suppression (obscuration due to direct fire), then only the current round is aborted as a result of this test (the test will be performed separately on subsequent rounds of this replication).

If the random number is greater than the probability of kill or suppression, then the mission continues to the next test with no effect from the direct fire.

- 2.2.15 Round Reliability Failure. The round is next tested for inflight reliability. A random number is drawn from a uniform distribution (0 to 1) and compared to the round reliability. If the random number is less than the reliability, the round is reliable and the next test is made; otherwise, the round fails.
- 2.2.16 Target Obscured By Mini-Terrain. The D.O.-to-target range is computed allowing for target movement up to the current model time (actually, the time the first (or next) COPPERHEAD round is to arrive). A distribution of target exposures (due to mini-terrain) at that range is then sampled to determine whether the target is fully exposed, hull defilade (turret exposed), or completely obscured. If the target is completely obscured, then the round aborts; otherwise, the next test is made.

2.2.17 Round Did Not Engage Target. The next test determines whether the COPPERHEAD round receives sufficient reflected laser energy to initiate maneuver to a target and has the target in its maneuver footprint.

To perform this test, a random number is drawn from a uniform (0 to 1) distribution and then compared to a probability of seeker engagement value which is a function of designator-to-target range, visibility range limit, cloud ceiling altitude, delay time, and number of vehicles in column as well as reflectivity of target, seeker sensitivity, target heading, target velocity, nominal COPPERHEAD system response time, gun-target-D.O. angle, designator type, and deflection biases (offsets). The probability of seeker engagement is the probability that both the seeker receives sufficient reflected laser energy to initiate tracking and the target is within the maneuver footprint of the COPPERHEAD round. If the random number is less than the probability of seeker engagement, then the next test is performed; otherwise, the round fails because its seeker cannot engage the target (or can engage but cannot maneuver to the target).

2.2.18 Round Engaged But Did Not Hit. A probability that the round hits the target given that it engages (i.e., passes the previous test) is obtained as a function of range, exposure (fully exposed or hull defilade), and designator type. A table of these probabilities is obtained as output from the LDWSS program and is intended to account for the possibility that the COPPERHEAD seeker tracks laser over-spill or under-spill rather than the target itself.

Again a uniform distribution (0 to 1) is randomly sampled. If the resulting random number is less than the probability that the round hits, then the round hits the target and we proceed to the next test; otherwise, the round misses and aborts.

- 2.2.19 Round Hit But Did Not Kill. The final test is to determine whether the round killed the target given that it hit the target. To perform this test, a random number is drawn from a uniform distribution (0 to 1) and compared to a probability of kill given a hit value which is a function of target type and target exposure (fully exposed or hull defilade). If the random number is less than the probability of kill, then the target is killed; otherwise, the target is not killed and the round aborts.
- 2.2.20 Subsequent Rounds. When a round (not a mission) aborts, subsequent tests in the sequence are not made. Instead, the time is advanced to the next round's arrival time (if there are more rounds left to be considered) and the sequence of tests resumes at the "LOS lost during mission" (section 2.2.12) test for the next round.

If a round does not abort, but instead successfully kills a target, then the time is advanced to the next round's arrival time (if applicable) and the sequence of tests resumes at the "LOS lost during mission" (section 2.2.12) test for the next round.

When no more rounds remain to be fired for a given replication, the replication is ended.

- 2.2.21 End of Replication. When either a mission (not a round) aborts or all the rounds for a replication have been fired, the replication is considered ended. If more replications remain to be made, the next replication begins with the first test, "Preparatory fires" (section 2.2.2) and proceeds through the sequence of tests as described. If all replications for the current case are done, then the results are printed out and the subsequent case (if any) is begun.
- Model. The step by step description given above of the various tests that must be passed for a successful COPPERHEAD fire mission applies to the "Shooting Gallery" or single continuous LOS segment model. This model assumes that the entire COPPERHEAD mission must be completed during the time interval from the first target vehicle's breaking terrain mask until the last target vehicle leaves that same LOS segment.

The alternate LOS model is called the "Random Occurrence" LOS model and assumes that after the first target vehicle breaks terrain mask, the target vehicles will go in and out of mask at random. The sequence of tests for the random occurrence method is the same as for the shooting gallery except that tests 4 and 11 (sections 2.2.5 and 2.2.11) are omitted and test 12 is modified.

Test 12 (section 2.2.12) is modified so that the probability that at least one target vehicle is visible is given by $Q = 1 - (1 - P)^N$ where P is the probability of a single vehicle being visible if randomly placed along an approach path at the current D.O.-to-target range and N is the number of vehicles left unkilled in the target. A random number is sampled from a uniform distribution (0 to 1) and compared to Q. If the random number is greater than Q, the round is aborted; otherwise, the mission continues with test 13.

2.2.23 Note on Nominal Response Time. The probability of engagement numbers are a function of the time after the D.O.'s call for fire that the rounds arrive. The time is played by establishing a nominal response time $\overline{t_r}$ (an average value for the distribution of total mission communication and processing times which is input and to which is added the time of flight appropriate for the given gun-to-target range.) The model assumes that the D.O. estimates the target's location at $\overline{t_r}$ seconds in the future and calls for fire against that point. The actual COPPERHEAD mission response time is sampled and added to the time of flight to obtain the actual arrival time of the round (t_a). If t_a is greater than t_r , then the probability of engagement is lowered because of the larger aiming error and TLE.

This is explained in greater detail in the report on the PAM model. The report on modeling target location error (TLE) discusses the problem of estimating target location and the error in the estimate as a function of time (see bibliography).

The only point important to the user at this stage is that COPE uses two response times: a nominal response time \overline{t}_r and an actual response time t_a . The nominal response time is used to estimate target's future location and hence to choose the point at which to aim. The actual response time is used to determine the probability of seeker engagement (PE). Naturally, if t_a is very large, the probability of the target being at the point estimated (based on \overline{t}_r) is quite small.

Also, it was assumed that if the firing battery saw that t_a was likely to be less than $\overline{t_r}$ on a particular occasion, it would hold up firing to cause $t_a = \overline{t_r}$ rather than drop early rounds far in front of the target. This assumes a good communication capability between D.O. and battery.

CHAPTER 3

PERFORMANCE AND LIMITATIONS

3.1 Computer Related Performance and Limitations.

The COPE program (and its preprocessor programs) has been run primarily on the U.S. Army Ballistic Research Laboratory's Control Data Corporation CYBER 76 computer (CDC 7600). On that computer, a typical case with 10,000 replications and six rounds fired per successful COPPERHEAD mission requires 2.5 to 3.0 seconds per case. The computer memory requirement is about 24,000 words (57 Kg) of SCM and no LCM. The disk space required (which will vary with the size of the data base file) for TAPE 11 was about 155,000 words (456 Kg).

COPE has also been run on a CDC 6600 at Aberdeen Proving Ground and on a CDC 6400 and a CDC 6500 at FT. Leavenworth (using the remote terminal at FT. Sill). On these machines, the run time ranged from eight to sixteen times what it was on the CDC 7600. The memory requirements and disk space on the various CDC 6000 series computers were nearly the same as for the CDC 7600.

At the time of this writing, COPE has not been run on any non-CDC machines; however, chapter 13 of this manual considers some of the changes required to do so. Run time would, of course, vary from machine to machine (e.g., the author's experience with other FORTRAN programs suggests run time on the UNIVAC 1108 computer would be eight to ten times that on the CDC 7600).

Most current non-CDC computers use a word size of fewer than 60 bits (the CDC word size). This means that the program memory required to load the object program on most non-CDC machines will be somewhat larger in terms of number of words than for the CDC computers. Similarly, a slight increase in disk space may be required to put the data base file TAPE 11 on a smaller word machine.

3.2 Program Related Performance and Limitations.

The current version of COPE has been run several hundred times now with no errors detected other than those resulting from invalid input, insufficient run time requested, or insufficient print limit set.

The ability of the program to run multiple cases with relatively small streams of input directives has enabled the users to run hundreds of cases with relatively short set up time.

The main limitation encountered in running the program is the requirement that data selected to fill the eight data blocks be on the random access mass storage data base file created by the preprocessor programs. Once these preprocessors are run, any case using data already on the data base file can be easily run. This subject is discussed in detail in chapter 5.

3.3 Model Related Performance and Limitations.

One of the main limitations of the COPE model is that much tactical detail is represented by distributions. For this reason, great care must be taken to interpret input distributions when reporting model results. The interpretation of results depends heavily on the conservatism and objectivity of the analyst.

The only attempt (and indeed the only opportunity) to verify the COPE model was by running it with case descriptors matching as closely as possible conditions present in the COPPERHEAD OT II. When this was done, the results predicted by COPE were compared to those obtained in OT II and found to be in quite close agreement. More precisely, the hypothesis that the probability of hit given a shot as obtained from COPE is equal to the true population probability of hit given a shot could not be rejected even with a significance level as high as 50 percent based on the sample of firings in OT II.

This good agreement of the model to test results should not lead to uncritical acceptance of all COPE results. For one thing, tests 1, 5, 6, and 14 were nulled out (that is, always passed). Also, since the OT II rounds were not live, the probability of kill values (test 19) in the model were set to one (so that kills and hits were considered equivalent).

gun, D.O., and target positions is only approximated. For any given simulated COPPERHEAD mission, the gun-to-target range, designator-to-target point-of-unmask range, target heading, and nominal gun-target-designator angle are fixed while the target itself moves (i.e., its position is a function of time).

Figure 3-1 represents the geometry of a COPPERHEAD fire mission.

U is the point of target unmask.

 $\ensuremath{\mathsf{R}}$ is the point at which round is to arrive on target (provided nominal response time is met).

D is the designator operator location.

G is the gun location.

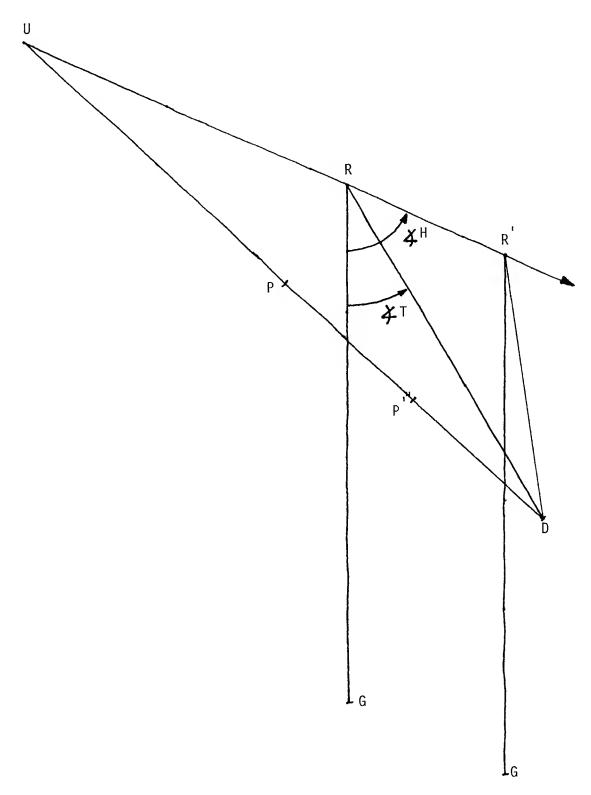


FIGURE 3-1 Geometry of COPPERHEAD Fire Mission

XH is the target heading (angle between gun-target line and target path at time round arrives on target).

XT is the angle between the gun-to-target line (GR) and the designator-to-target line (\overline{DR}).

UR is the target's path (target travels from U to R).

By the COPE case conditions chosen, $\mbox{\ensuremath{XT}}$, $\mbox{\ensuremath{XH}}$, the length of $\mbox{\ensuremath{\overline{GR}}}$, and the length of $\mbox{\ensuremath{\overline{UD}}}$ are constant (the first three are constant for a given replication, but is sampled anew for each replication). Hence, if the response time is such that the target is at R' on one replication rather than at R (as on, say, a previous replication) when the round arrives, one must move G to $\mbox{\ensuremath{G'}}$, and D to D' to preserve the fixed values of $\mbox{\ensuremath{XT}}$, $\mbox{\ensuremath{XH}}$, length of $\mbox{\ensuremath{GR}}$ (now $\mbox{\ensuremath{G'R'}}$).

The requirement that G move to G' is, of course, unrealistic since one does not move the battery to a new site just because nominal response time is not met.

A second compromise in the geometric representation of the COPPERHEAD mission is in calculating the designator—to—target range. Rather than compute the designator—to—target range \overline{DR} (or \overline{DR} ' in the second case) in the correct manner, the COPE model approximates the designator—to—target range by the distance \overline{PD} . P is a point chosen on \overline{UD} such that \overline{UP} = \overline{UR} (or P' such that \overline{UP} ' = \overline{UR} ' in the second case). This approximation is equivalent to the assumption that the target moves straight toward the designator.

One can see from the line segment lengths in Figure 3-1 that \overline{PD} does not differ greatly from \overline{RD} (in this case) whereas $\overline{P'D}$ does differ considerably from $\overline{R'D}$ in length. For typical range values and velocities used so far in COPE, these errors are considered minor. If one is to use greater target velocities or shorter acquisition ranges, then it would be worthwhile to improve this feature of COPE. (That is, incorporate the trigonometry required to correctly calculate \overline{DR} (or $\overline{DR'}$) and use that value instead of \overline{PD} (or $\overline{DP'}$).

Note: The designator operator-to-target distance is used not only at round arrival to calculate probability of engagement and probability of hit; but also throughout the simulation it is updated and used in checking bail-outs, direct fire suppression, line-of-sight probability for random occurrence, etc.

3.3.2 Target Modeling. The COPE model makes simplifying assumptions about the target. In particular, it assumes that the target is a column of vehicles moving at constant velocity with uniform spacing between successive vehicles. When a vehicle is killed, the length of the column is not reduced in length nor is any attempt made to keep a record of the position that the killed vehicle occupied in the column.

These limitations were not deemed serious in the COPE runs for the COPPERHEAD COEA; however, for the SADARM variant of COPE (called SOPE) the model was modified to keep track of individual vehicle status and to handle more general target layouts. (These modifications were essential to SADARM where there is no designator operator to pick out live targets instead of dead ones, and where the volley attacks an area instead of a point as with a single COPPERHEAD round).

3.3.3 Direct Fire Effects Independent. The model of direct fire effects of the target against the D.O. (see section 2.2.14) is oversimplified. The model has a single probability of kill (or obscuration) by direct fire for each target-to-D.O. range and this probability (corrected for then current range) is then applied during each COPPERHEAD round's firing to determine whether the D.O. is killed (or obscured) and thus prevented from lasing.

The shortcomings of this model are (1) subsequent rounds fired by the target at the D.O. should be more accurate both due to adjustment (assuming both that the D.O. survived previous rounds fired by the target and that the target survived previous COPPERHEAD's) by the target after seeing its first round impact and due to the D.O.'s giving away his position more times by the additional lasings, and (2) adjacent vehicles in the target unit, after seeing the lasings for the first few rounds, might join in firing at the D.O. on the latter rounds. Both effects (1) and (2) are omitted in COPE's model of direct fire against the D.O.

- 3.3.4 Only Initial Acquisitions (Unmaskings) Played. The COPE model only plays the first unmasking of each target unit. A more realistic assessment of COPPERHEAD's contribution would be obtained if the target unit were acquired (or, at least, unmasked to provide a potential acquisition) several times as it closes toward the BLUE position. This would require keeping track of the damage done to the RED target unit as the result of previous unmaskings (and the resulting COPPERHEAD fire missions) so as not to take credit for killing vehicles many times over. It would be a fairly straight forward task to modify the COPE program to allow for multiple acquisitions (and firing) of each target unit. The reason this was not done in the original COPE model is simply that all of the acquisition data (range to unmask and line-of-sight segment lengths) available to the model's creators were for first acquisition only.
- 3.3.5 Other Limitations. Other limitations to COPE are chiefly due to either inadequate data or to the desire to keep the model and program simple. These limitations include:
- (a) Availability of artillery to fire the $\mbox{COPPERHEAD}$ mission is not considered.
- (b) The impact of the attrition of a D.O. or an F.O. (forward observer) on the ability of the direct support artillery to perform its mission is not considered. That is, how much of the lost D.O. capability could be

picked up by neighboring D.O.'s, other Fire Support Team (FIST) members, or platoon F.O.'s?

(c) The permanent loss of communications is not played. This could be partially simulated by reducing the probability of a successful transmission, although that value was intended to represent only degradation due to high communication traffic load and electronic warfare.

CHAPTER 4

4. INPUT DIRECTIVES AND "DATA" STATEMENTS

4.1 Input.

Considerable effort has gone into making the COPE input versatile enough to allow for the running of nearly any combination of input parameters while at the same time requiring a minimum of input changes to switch from one case to another. The stacking of multiple cases for a single run can be easily accomplished with relatively few input cards.

The existence of "default" (baseline case) values built into the program allows the program to be run with only the input cards (or card images) required to change those variables which it is desired to set at other than the default values. If further cases are desired one can continue with additional input changes applied to either the previous case or the baseline case.

The program also allows the insertion of up to three types of user comments which may appear in the output.

Finally, in the event that one wishes to use data not in the "data base" file, a "temporary" option using traditional formatted data is available.

4.2 Data Organization.

For each case that is run, there are numerous parameters whose values are set to provide the mathematical description of that case. These parameters are grouped into eight major blocks, six condition keys, and twenty odd individually selected numerically valued variables.

For the most part, a single input card is used to select each block, key, or variable value. There are some exceptions and some dependencies between choices which are explained below (section 4.8).

Finally, there are numerous data items whose values are set in the Block Data (BDATA1) subprogram because they are relatively fixed from case to case. Obviously, if one chose to vary these items frequently, they could be made into input rather than set via data statements. These items are defined below (section 4.7)

4.3 Keyword Input: General Description.

Each input to select a case description (except when the "temporary" option is used) as well as various inputs to control program options is of the form:

where $0 \le n \le 9$. Each such input must be contained on one card (or card image); no continuation to another card is allowed.

The keyword is an alphanumeric character string indicating which case descriptor is to be set by the card.

The option words are either alphanumeric character strings that indicates which option is chosen from a pre-defined set or numerical values that are to be used for certain variables.

Option words are order dependent (i.e., $\frac{\text{keyword}, x, y}{\text{is not}}$ is not equivalent to $\frac{\text{keyword}, y, x}{\text{y}}$). If an option word is omitted, a default value is set by the program. If a keyword takes two or more optionwords and an option word other than the last one is omitted, then the proper number of separators (commas, for example) must be used to position the later optionwords (e.g.,

keyword, default value for option word 1, option word 2

is equivalent to

keyword, , option word 2

but not equivalent to

keyword, option word 2).

In most cases, blanks may be freely inserted within keywords or option words to improve readability. (The only exception is covered in the note of section 4.5.3.).

4.4 Keyword Input: Specifics.

Now each keyword is shown with the option words allowed. Note that new option words may be introduced by running the PREPMS pre-processor program to modify the data base file (section 5.3.8 and chapter 14).

4.4.1 FIRST CASE.

- (a) general form: FIRST CASE
- (b) This card is used only as the first non-comment card in an input deck. If it is omitted, the program will generate a message upon encountering the first non-comment card in the input and then proceed as though the FIRST CASE card were present.

4.4.2 NEXT CASE.

- (a) general form: <u>NEXT CASE</u>, option word 1
- (b) Currently allowed character strings for option word 1 are:
 - (1) RESET DEFAULTS or RD
 - (2) DON'T RESET or DR.
- (c) This card is the first non-comment card of each case other than the first case.

If the option word is <u>RESET DEFAULTS</u>, <u>RD</u>, or omitted, then the values for all case description parameters are reset to their default values and will differ from the baseline values only as determined by the remaining input cards for the current case.

If the option word is <u>DON'T RESET</u> or <u>DR</u>, then the values of the case description parameters remain at their values for the previous case except for those values changed by the remaining input cards for the current case.

If the $\underline{\sf NEXT}$ CASE card is omitted, the program will generate a message and proceed as though a $\underline{\sf NEXT}$ CASE, $\underline{\sf DR}$ card had been encountered.

 $\underline{\text{Note}}\colon$ The PLOT and CONTROL cards (sections 4.4.5 and 4.4.6) are not controlled by the option on the NEXT CASE card.

4.4.3 END.

- (a) general form: END
- (b) This card belongs at the end of the input for each case other than the final case.

If it is omitted, an error will usually result because the program will continue reading cards that are really part of the next case's input until it either hits an ENDF card, or the end of the input file. This means that the case will run using its own input together with input from subsequent case (or cases). The user can detect this problem from the fact that the case descriptors will probably be incorrect (i.e., other than the intended values) in the case heading print-out, there may be unexpected messages stating that certain input cards have superseded others, and finally, the number of cases in the run will be wrong.

4.4.4 ENDF.

(a) general form: ENDF or END OF FINAL CASE.

(b) This card should be the final card of the final case.

If it is omitted, the program will generate a message on reaching the end of input and then proceed as though an $\underline{\sf ENDF}$ had been encountered.

If an $\overline{\text{END}}$ card is used instead, there will be no change in the result but the program will waste a few nano-seconds before realizing that there is no more input.

If an $\overline{\text{ENDF}}$ is used prior to the end of the last case, any cards following the $\overline{\text{ENDF}}$ card will be ignored.

4.4.5 PLOT.

- (a) general form: PLOT, option word 1, option word 2
- (b) Allowed character strings for option word 1 are:
 - (1) PRINTER
 - (2) CALCOMP.

Allowed character strings for option word 2 are:

- (1) OFF
- (2) ON.
- (c) This keyword was designed to handle graphic output (bar charts), but has not been implemented in the current version of the program.

The cards <u>PLOT</u>, <u>PRINTER</u>, <u>ON</u> and <u>PLOT</u>, <u>CALCOMP</u>, <u>ON</u> would cause results to be displayed on bar graphs produced by the line printer and Cal-Comp plotter respectively. At the present time, however, these cards will only cause the program to generate a message saying that no plot was produced.

The cards <u>PLOT</u>, <u>PRINTER</u>, <u>OFF</u> and <u>PLOT</u>, <u>CALCOMP</u>, <u>OFF</u> turn off the production of the bar graphs produced by the line printer and Cal-Comp plotter respectively.

The default for option word 1 is $\frac{PRINTER}{}$; the default for optionword 2 is $\frac{OFF}{}$. So no bar graphs (or, at the present time, "no plot" messages) are produced unless positive action is taken by the user.

Note, that if and when this feature is implemented, the two types of graphs may be selected independently of each other.

A <u>PLOT</u> option once selected remains in effect until a further PLOT card is encountered changing the option (that is, ON to OFF or OFF to ON). It is not affected by a <u>NEXT CASE</u>, <u>RD</u> card.

4.4.6 CONTROL.

- (a) general form: CONTROL, option word 1, option word 2
- (b) Allowable choices for option word 1 are:
 - (1) ECHO

Allowable choices for option word 2 are:

- (1) SHORT
- (2) <u>LONG</u>.
- (c) This keyword is designed to control miscellaneous program features. At the present time, the only choice (and the default) for option word 1 is <u>ECHO</u>. If option word 2 is <u>SHORT</u> or omitted, then the short form of the input echoing is used; if option word 2 is <u>LONG</u>, the long form of the input echoing is used (see section 7.6 for input echoing).

The default (which occurs if the card is omitted) is the short form.

A <u>CONTROL</u> option once selected remains in effect until a further <u>CONTROL</u> card is encountered changing the option (that is, <u>LONG</u> to <u>SHORT</u> or <u>SHORT</u> to <u>LONG</u>). It is not affected by a <u>NEXT CASE</u>, <u>RD</u> card.

4.4.7 LINE OF SIGHT MODE.

- (a) general form: LINE OF SIGHT MODE, option word $\underline{1}$ or LOS MODE, option word $\underline{1}$
- (b) Allowable choices for option word 1:
 - (1) SHOOTING GALLERY or SG
 - (2) RANDOM OCCURRENCE or RO.
- (c) The choice of SHOOTING GALLERY or SG for option word 1 causes the current case to be run using the "shooting gallery" line of sight model. If option word 1 is RANDOM OCCURRENCE or RO, then the "random occurrence" line of sight model is used.

The default is the "shooting gallery" model.

4.4.8 MISSION CODE

- (a) general form: MISSION CODE, option word 1 or MSNCODE, option word 1
- (b) Allowable character strings for option word 1 are:
 - (1) PRIORITY PREPLANNED TARGET or PPPT
 - (2) PREPLANNED TARGET or PPT
 - (3) TARGET OF OPPORTUNITY or TOO.
- (c) If option word 1 is <u>PRIORITY PREPLANNED TARGET</u>, <u>PPPT</u>, or omitted, then the mission is considered priority preplanned; if option word 2 is <u>PREPLANNED TARGET</u> or <u>PPT</u>, then the mission is considered preplanned; and, if option word 2 is <u>TARGET OF OPPORTUNITY</u> or <u>TOO</u>, then the mission is considered a target of opportunity.

The mission type affects the response time parameters used (see section 4.4.15) and the modeling of range from unmask to centroid (RUMC, section 4.4.18). See section 4.8 for side effects of mission code choice.

4.4.9 NUMBER OF DIFFERENT TARGET POSTURES.

- (a) general form: <u>NUMBER OF DIFFERENT TARGET POSTURES</u>, option word 1 or NUMDIFTGTP, option word 1
- (b) Allowable character strings for option word 1 are:
 - (1) <u>THREE</u> or <u>3</u>
 - (2) $\underline{\text{TWO}}$ or $\underline{2}$.
- (c) If option word 1 is THREE, 3, or omitted, the target exposure (mini-terrain) model plays three exposures or postures (fully exposed, hull defilade, and completely obscured).

If option word 1 is $\overline{100}$ or 2, the target exposure model plays two exposures (fully exposed and hull defilade) with the completely obscured divided between the other two postures in proportion to their relative fractions.

The default option word 1 is THREE.

4.4.10 TARGET TYPE.

- (a) general form: TARGET TYPE, option word 1
- (b) Allowable character strings for option word 1 are:

- (1) 1
- (2) 2
- $(3) \ \ 3$
- $(4) \frac{4}{}$
- (5) 5
- (6) 6
- $(7) \frac{7}{2}$
- (c) If option word 1 is i, then the vulnerability values (probability of kill given a hit as a function of target exposure) for target type i are used.

The default target type is 1.

4.4.11 DESIGNATOR TYPE.

- (a) general form: <u>DESIGNATOR TYPE</u>, option word 1 or <u>DESIGTYPE</u>, option word 1
- (b) Allowable choices for option word 1 are:
 - (1) \underline{GLLD} or \underline{G}
 - (2) MULE or M
 - (3) \underline{LTD} or \underline{L}
- (c) If option word 1 is <u>GLLD</u>, <u>G</u>, or omitted, the designator type is the <u>GLLD</u>; if option word 1 is <u>MULE</u> or <u>M</u>, the designator type is the MULE; and, if option word 1 is <u>LTD</u> or \underline{L} , the designator type is the LTD.

The default designator type is GLLD.

See section 4.8 for side effects of Designator Type Choice.

4.4.12 DO POSITION.

- (a) general form: DO POSITION, option word 1
- (b) Allowable choices for option word 1 are:
 - (1) VANTAGE POINT or VP
 - (2) MANEUVER UNIT or MU.

(c) If option word 1 is <u>VANTAGE POINT</u>, <u>VP</u>, or omitted, then the target posture table gives break down into target exposure as seen from a vantage point.

If option word 1 is $\underline{\mathsf{MANEUVER}\ \mathsf{UNIT}}$ or $\underline{\mathsf{MU}}$, then a target posture table is used which gives the breakdown into target exposures as seen from a position down with the maneuver units.

The default for DO POSITION is VP.

4.4.13 WEATHER.

- (a) general form: $\underline{\text{WEATHER}}$, option word 1, option word 2 or $\underline{\text{W}}$, option word $\underline{\text{I}}$, option word 2
- (b) Allowable choices for option word 1 are:
 - (1) JUNE or J
 - (2) DECEMBER or D
 - (3) MARCH or M
 - (4) SEPTEMBER or S

Allowable choices for option word 2 are:

- (1) <u>1400</u> or <u>14</u>
- (2) 0600 or 06
- (3) 2200 or 22.
- (c) The weather data used in COPE is grouped into sets of data; each set corresponding to a certain month and time-of-day combination.

The choice for option word 1 determines the month whose weather data are to be used for the current case.

The choice for option word 2 determines the time-of-day whose weather data are to be used for the current case.

The defaults are $\underline{\text{JUNE}}$ or $\underline{\text{J}}$ for option word 1 and $\underline{\text{1400}}$ or $\underline{\text{14}}$ for option word 2.

See section 4.8 for side effects of weather choice.

4.4.14 ACQUISITION RANGE DISTRIBUTION.

(a) general form: ACQUISITION RANGE DISTRIBUTION, option word 1 or ACQRNGDIST, option word 1

- (b) Allowable choices for optionword 1 are:
 - (1) AVERAGE or Λ
 - (2) CLOSE or C
 - (3) OPEN or 0.
- (c) If option word 1 is <u>AVERAGE</u>, <u>A</u>, or omitted, then the acquisition range and line-of-sight segment length distributions used are those for TETAM "average" terrain. If option word 1 is <u>CLOSE</u> or <u>C</u>, then distributions for TETAM "close" terrain are used. If option word 1 is <u>OPEN</u> or <u>O</u>, then distributions for TETAM "open" terrain are used.

The default is to use TETAM "average" terrain.

See section 4.8 for side effects of acquisition data choice.

4.4.15 RESPONSE TIME.

- (a) general form: RESPONSE TIME, option word 1, option word 2, option word 3, or RESPTIME, option word 1, option word 2, or option word 3
- (b) Allowable choices for option word 1 are:
 - (1) FTSILL or FS
 - (2) STAUCH or S
 - (3) SCUNGIO
 - (4) PARAM

Allowable choices for option word 2 are:

- (1) DIGITAL or D
- (2) $\underline{\text{VOICE}}$ or $\underline{\text{V}}$
- (3) a positive numerical value (which represents response time in seconds).

Allowable choices for option word 3 are:

- (1) DAY or D
- (2) NIGHT or N.

(c) If option word 1 is <u>FT SILL</u>, <u>FS</u>, or omitted, then the response time distribution supplied by USAFAS at FT Sill is used. This plays the first way of modeling delay time as described in Section 2.2.9.

If option word 1 is $\underline{\mathsf{STAUCH}}$ or $\underline{\mathsf{S}}$, the response time numbers are obtained from the BCS DT II for some processes and TACFIRE tests for others. These data were supplied by Ed Stauch of AMSAA and use the third way of modeling delay time as described in Section 2.2.9.

If option word 1 is $\underline{SCUNGIO}$, then the response time distribution used is a hypothetical distribution created by Richard Scungio of AMSAA to test the sensitivity of COPPERHEAD performance to longer response time. In this case the third modeling of response time (see Section 2.2.9) is used.

If option word 1 is PARAM, then the second way of modeling response time delay (see Section 2.2.9) is employed (so-called "parameterized" response time). In this case, the response time is a constant equal to the positive numerical value used as option word 2.

If option word 2 is $\overline{\text{DIGITAL}}$, $\overline{\text{D}}$, or omitted, then digital communication is used (with voice back-up when using the third way of modeling in Section 2.2.9).

If option word 2 is \underline{VOICE} or \underline{V} , then voice communication is used (this will have an affect only when used with the third way of modeling in Section 2.2.9)

If option word 2 is a positive numerical value, then this value is used as the "parameterized" response time. This can only be used with the $\frac{PARAM}{PARAM}$ choice for option word 1. A zero or blank option word 2 value used with $\frac{PARAM}{PARAM}$ as option word 1 will cause the program to stop (see section 7.5.18).

(Note: If one really wishes to run a zero parameterized response time value, a value of .001 could be used. The difference between these results and those obtained with a true zero response time would be far below the noise in the model).

If option word 3 is \overline{DAY} , \overline{D} , or omitted, day time response times are used. If option word 3 is \overline{NIGHT} or \overline{N} then nighttime response times are used. In addition, the choice of day or night influences the target velocity and maximum designator range (see Sections 4.4.21 and 4.4.22).

The defaults are: for option word 1, $\overline{\text{FTSILL}}$; for option word 2, $\overline{\text{DIGITAL}}$; for option word 3, $\overline{\text{DAY}}$.

See section 4.8 for side effects of response time data choice.

4.4.16 DIRECT FIRE SUPPRESSION.

- (a) general form: DIRECT FIRE SUPPRESSION, option word 1 or DFIRESUPPR, option word 1
- (b) Allowable choices for option word 1 are:
 - (1) HIGH or H
 - (2) NONE or N
- (c) If option word 1 is $\underline{\text{HIGH}}$, $\underline{\text{H}}$ or omitted, then the direct fire suppression (obscuration from direct fire) and kill table used is for a high level of D.O. suppression and kill (corresponding to tank fire at the D.O.)

If option word 2 is $\underline{\text{NONE}}$ or $\underline{N},$ then there is no effect of direct fire on the D.O..

The default is HIGH.

4.4.17 INVARIANT.

- (a) general form: INVARIANT, option word 1
- (b) Allowable choices for option word 1:

none

(c) The only currently allowed choice for invariant data is the default. Provision for other choices is built into the program for possible future use and may be activated by appropriate preprocessor run(s).

4.4.18 RUMC.

- (a) general form: RUMC, option word 1
- (b) Allowable choices for option word 1 are:
 - (1) \underline{NO} or \underline{N}
 - (2) a numerical value.
- (c) The RUMC (which stands for range from unmask to centroid) value is the distance from the point at which the target breaks terrain mask to the centroid of the COPPERHEAD footprint.

If option word 1 is $\underline{\text{NO}}$, $\underline{\text{N}}$ or omitted, then RUMC is assumed to vary with each replication in such a way that the centroid of the footprint is set at the predicted target (first vehicle) location for first round arrival. This predicted location is based on the nominal (estimated) response time (including time-of-flight) and the target velocity.

If option word 1 is a numerical value, then RUMC remains at that value for each replication.

The RUMC keyword has an effect only when the MISSION CODE is $\frac{\text{PPPT}}{\text{PPT}}$ or $\frac{\text{PPT}}{\text{PPT}}$ (see Section 4.4.8). If the MISSION CODE is $\frac{\text{TOO}}{\text{NO}}$, then the program behaves as though option word 1 were $\frac{\text{NO}}{\text{PPT}}$ regardless of what may be input on a RUMC card.

The default for \underline{RUMC} is \underline{NO} .

4.4.19 SMOKE.

- (a) general form: SMOKE, option word 1, option word 2, option word 3
- (b) Allowable choices for option word 1:
 - (1) SMOKE ROUNDS FIRED or SMKRNDS
 - (2) PROBABILITY SMOKE KILLS MISSION or PRBSMOKE.

Allowable choices for option word 2:

(1) a numerical value

Allowable choices for option word 3:

- (1) a numerical value.
- (c) If option word 1 is <u>SMOKE ROUNDS FIRED</u>, <u>SMKRNDS</u>, or omitted, then option words 2 and 3 respectively give the numbers of type 1 smoke rounds fired and type 2 smoke rounds fired.

If option word 1 is PRBSMOKE, then option word 2 gives the probability that smoke kills the potential COPPERHEAD fire mission.

The default for option word 1 is $\underline{\mathsf{SMKRNDS}}$. The default for option word 2 is 484 when option word 1 is $\underline{\mathsf{SMOKE}}$ ROUNDS $\underline{\mathsf{FIRED}}$ or $\underline{\mathsf{SMKRNDS}}$, but it is .40 when option word 1 is $\underline{\mathsf{PROBABILITY}}$ SMOKE KILLS MISSION or $\underline{\mathsf{PRBSMOKE}}$.

The default for option word 3 is 846 when option word 1 is $\underline{\text{SMOKE}}$ ROUNDS FIRED or $\underline{\text{SMKRNDS}}$; it is unused otherwise.

Note: When the first alternative for SMOKE option word 1 is chosen, the probability that smoke aborts the potential COPPERHEAD mission is calculated as a function of the number of smoke rounds of each type fired and the weather conditions.

When the second alternative is used, the value input for option word 2 (a probability between 0 and 1) is used as the probability that smoke aborts the potential COPPERHEAD mission. (See section 2.2.6)

4.4.20 DO ARTILLERY PK.

- (a) general form: DO ARTILLERY PK, option word 1 or DOARPK, option word 1
- (b) Option word 1 must be either a numerical value between 0 and 1 or omitted.
- (c) The numerical value input for option word 1 is used as the probability that the D.O. is killed by RED preparatory artillery fire.

The default value is .01.

4.4.21 TARGET VELOCITY.

- (a) general form: TARGET VELOCITY, option word 1 or TGTVEL, option word 1
- (b) Option word 1 is a positive number which gives the target velocity in meters per second. (The program is currently set up to accept only 2, 3, 5, 8, or 9 as allowed velocity).
- (c) The value of option word 1 is used as the target velocity.

The default target velocity is obtained from a table (part of the acquisition range data block) giving target velocities as a function of day or night, weather, and terrain type.

Note: For side effects of velocity choice, see section 4.8.

4.4.22 MAXIMUM DESIGNATOR RANGE.

- (a) general form: MAXIMUM DESIGNATOR RANGE, option word 1 or MAXDESRNG, option word 1
- (b) Option word 1 is a positive number giving the maximum designator range in meters. This is the designator range mentioned in section 2.2.4.

The default maximum designator range is obtained from a table giving ranges as a function of designator type and day or night.

Note: For side effects of designator range value, see section 4.8.

4.4.23 BAIL OUT RANGE.

- (a) general form: BAIL OUT RANGE, option word 1 or BAILOUTRNG, option word 1
- (b) Option word 1 is a positive number giving the bail-out range in meters (see section 2.2.8 and 2.2.10). The default bail-out range is 1000m.

4.4.24 TIME OF FLIGHT.

- (a) general form: <u>TIME OF FLIGHT</u>, option word 1 or <u>TOF</u>, option word 1
- (b) Option word 1 is a positive number giving the time of flight of the COPPERHEAD round in seconds.

The default value for time of flight is obtained from a table giving times of flight as a function of gun-to-target range.

Note: For side effects of time of flight value, see section 4.8.

4.4.25 ANGLE T.

- (a) general form: ANGLE T, option word 1
- (b) Option word 1 is a number giving the angle (in degrees) between the gun-to-target line and the designator-to-target line. The default value is 25 degrees.

Note: For side effects of angle T value, see section 4.8.

4.4.26 DUST.

- (a) general form: <u>DUST</u>, option word 1
- (b) Option word 1 is a number from 0 to 1 whose value is the probability that dust kills the potential COPPERHEAD mission.

The default value is .37.

4.4.27 PROBABILITY OF SUCCESSFUL VOICE TRANSMISSION.

(a) general form: PROBABILITY OF SUCCESSFUL VOICE TRANS-MISSION, option word 1 or PRBVOCTRAN, option word 1

(b) Option word 1 is a number from 0 to 1 whose value is the probability that voice communication is established between the D.O. and the battery FDC.

The default value is .975.

4.4.28 PROBABILITY OF SUCCESSFUL DIGITAL TRANSMISSION.

- (a) general form: PROBABILITY OF SUCCESSFUL DIGITAL TRANS-MISSION, option word 1 or PRBDGTTRAN, option word 1
- (b) Option word 1 is a number from 0 to 1 whose value is the probability that digital communication is established between the D.O. and the battery FDC.

The default value is .915.

4.4.29 ROUND IN FLIGHT RELIABILITY.

- (a) general form: ROUND IN FLIGHT RELIABILITY, option word 1 or RNDFLTREL, option word 1
- (b) Option word 1 is a number between 0 and 1 whose value is the probability that the round is reliable (functions properly).

The default value is .96.

4.4.30 TIME BETWEEN ROUNDS.

- (a) general form: <u>TIME BETWEEN ROUNDS</u>, option word 1 or TBR, option word 1
- (b) Option word 1 is a number whose value is the time (in seconds) between the firing of successive COPPERHEAD rounds.

The default value is 20 seconds.

4.4.31 NUMBER OF REPLICATIONS.

- (a) general form: NUMBER OF REPLICATIONS, option word 1 or NUMREP, option word 1
- (b) Option word 1 is the number of replications (i.e., Monte Carlo sample size of potential COPPERHEAD fire missions) to be used for the current case.

4.4.32 NUMBER OF ROUNDS TO BE FIRED.

(a) general form: NUMBER OF ROUNDS TO BE FIRED, option word 1 or NUMRNDS, option word 1

(b) Option word 1 is the number of rounds to be fired on each potential COPPERHEAD fire mission of this case that reaches the point where firing occurs (i.e., a "shot" event). Since each round is fired and completes its flight (successfully or not) before the next round arrives, one may choose to think of the number of rounds to be fired as the number of one round volleys to be fired.

The default value is 6 rounds.

4.4.33 NUMBER OF VEHICLES PER TARGET.

- (a) general form: NUMBER OF VEHICLES PER TARGET, option word 1 or NUMVEHTGT, option word 1
- (b) Option word 1 is the number of vehicles in the target column.

The default value is 10 vehicles.

4.4.34 DISTANCE BETWEEN VEHICLES.

- (a) general form: <u>DISTANCE BETWEEN VEHICLES</u>, option word 1 or DISTBVEH, option word 1
- (b) Option word 1 is the mean distance (in meters) between adjacent vehicles in the target column.

The default value is 61 meters.

4.4.35 GUN TARGET RANGE.

- (a) general form: <u>GUN TARGET RANGE</u>, option word 1 or GTRNG, option word 1
- (b) Option word 1 is the gun-to-target range in kilometers.

The default value is 8 kilometers.

Note: For the side effects of gun-to-target range, see section 4.8.

4.4.36 REFLECTIVITY.

- (a) general form: <u>REFLECTIVITY</u>, option word 1 or <u>REFLECT</u>, option word 1
- (b) Option word 1 is a number between 0 and 1 whose value is the reflectivity of the target to laser energy (i.e., it is the fraction of the laser energy at the designator's frequency that is reflected by the target).

The default value is .10.

Note: The side effects of reflectivity are discussed in section 4.8.

4.4.37 DEFLECTION BIAS.

- (a) general form: <u>DEFLECTION BIAS</u>, option word 1 or <u>DEFB</u>, option word 1
- (b) Option word 1 is the value in meters of the deflection bias which is to be defined as the minimum distance from the target column's path (a line) to the footprint centroid (a point).

The default value is 0.

Note: The side effects of deflection bias are discussed in section 4.8.

4.4.38 TARGET HEADING.

- (a) general form: TARGET HEADING, option word 1 or TGTHDG, option word 1
- (b) Option word 1 is a number whose value is the angle (in degrees) between the target's line of travel and the target-to-qun line.

The default value is 0.

Note: The side effects of target heading are discussed in section 4.8.

4.4.39 SEEKER SENSITIVITY.

- (a) general form: <u>SEEKER SENSITIVITY</u>, option word 1 or <u>SEEKSENS</u>, option word 1
- (b) Option word 1 is a number whose value is the minimum amount (threshold value) of energy per area (in joules per square meter) that must reach the COPPERHEAD seeker in order to initiate maneuver.

The default value is 60 joules/ m^2 . (The true value is not used as the default to avoid any possible classification problem.)

 $\underline{\text{Note}}$: The side effects of the seeker sensitivity value are discussed in section 4.8.

4.4.40 PROBABILITY OF A CORRECT MESSAGE.

- (a) general form: PROBABILITY OF A CORRECT MESSAGE, option word 1 or PROBCORMSG, option word 1
- (b) Option word 1 is a number whose value is the probability that the D.O. sends correct information to the FDC and the FDC interprets it correctly.

The default value is .975.

4.4.41 PROBABILITY DO WARNED TO LASE.

- (a) general form: PROBABILITY DO WARNED TO LASE, option word 1 or PROBDOWARN, option word 1
- (b) Option word 1 is a number whose value is the probability that the message warning the D.O. to begin lasing for the first COPPERHEAD round is transmitted and received successfully.

The default value is .975.

4.5 Special keywords: OVERRIDE, TEMPORARY, RESET.

4.5.1 Correspondence of Data Blocks to Keywords. As mentioned previously, a large part of the data used in each case is grouped into eight blocks. Each of these blocks is normally filled by reading a record from a word addressible mass storage file that is created by the PREPMS and PAM programs. The choice of which particular record to read from the file to fill each data block depends on the various keywords and option words for the case.

This correspondence of data blocks to keywords can be summarized as follows:

	rd to be read for block of this type	Depends on options this (these) keywords
(1)	Weather	WEATHER
(2)	Acquisition range data	ACQRNGDIST
(3)	Response time data	RESPTIME
(4)	Direct fire suppression data	DFIRESUPPR
(5)	Random occurrence data	ACQRNGDIST and TGTVEL
(6)	Probability of engagement data	RESPTIME, MSNCODE, DESIGTYPE, TGTVEL, GTRNG, REFLECT, ANGLE T, DEFLB, TGTHDG, SEEKSENS

(7) Target posture distribution

FO POSITION

(8) Invariant data

INVARIANT

As can be seen, there is but one keyword influencing the choice of record to be read for each data block except in the cases of random occurrence data and probability of engagement data.

4.5.2 OVERRIDE and TEMPORARY Features. Two additional methods of filling in a data block are provided. The first is to choose a record from the word addressible mass storage file to be read into the data block without regard to the options chosen for the keyword(s) that would normally determine the record choice; this is the OVERRIDE feature. The second is to actually supply alternative data as traditional formatted FORTRAN inputs to be read into the data block; this is the TEMPORARY feature.

The OVERRIDE option is provided primarily so that one can choose to use probability of engagement (PE) data that has been generated with one set of conditions under other, not too different, conditions without having to re-run the PAM program. For example, PE data for a case with nominal response time, 130 sec. could be used to run a case identical (in those factors affecting PE) except for a nominal response time of 150 sec. The advantage of this procedure is that one can avoid re-running the relatively expensive PAM program in those cases where the factors affecting PE have changed very little. The disadvantage, of course, is that there are no efficient objective criteria available to determine whether the errors introduced by using wrong (but, it is hoped, approximate) PE data are significant in a given situation.

The TEMPORARY option is provided so that one can directly load data into any data block without having to use the PREPMS preprocessor program. This option allows one to use data for a given run without running the PREPMS program to make that data a "permanent" record in the data base file. This option was provided for flexibility, but was not exercised at all in the original COPPERHEAD Operational Performance Evaluation done for the COEA.

4.5.3 Using the OVERRIDE.

- (a) general form: $\underbrace{\text{OVERRIDE}}_{\text{OVERIDE}}$, keyword, option word 1 or
- (b) Choices for keyword are:
 - (1) WEATHER or W
 - (2) ACQUISITION RANGE DISTRIBUTION or ACQRNGDIST
 - (3) RESPONSE TIME or RESPTIME

- (4) <u>DIRECT FIRE SUPPRESSION</u> or <u>DFIRESUPPR</u>
- (5) RANDOM OCCURRENCE DISTRIBUTION or RODIST
- (6) PEDATA
- (7) TARGET POSTURE DISTRIBUTION or TGTPSTDIST
- (8) INVARIANT

Option word 1 is the name of any record (on the random access mass storage data base file) containing data for the data block type specified by the keyword choice.

(c) The OVERRIDE causes the selected data block (or blocks, if more than one OVERRIDE card is used in a case) to be filled with data from the record whose name is option word 1.

There is no default for OVERRIDE. An error will result from the omitting of either the keyword or option word 1.

Note: If the record name includes one or more blanks or separators then the record name must be preceded by a "\$" (dollar sign). The ten characters forming the record name must immediately follow the dollar sign, any blanks in the name must be included in their proper positions, and no excess blanks may be inserted. For present purposes, separators include commas, slashes, question marks, and parentheses.

4.5.4 Using TEMPORARY.

- (a) general form: <u>TEMPORARY</u>, keyword or <u>TEMP</u>, keyword
- (b) Choices for keyword are as in section 4.5.3.
- (c) The use of the TEMPORARY option will cause the program to begin reading data in FORTRAN formatted fashion. Hence, each use of the TEMPORARY option must be immediately followed by the formatted data cards to be read to fill the data block selected by the keyword.

The formats to be used and the data to be supplied for each block are identical to those used by the PREPMS program for the corresponding block (see section 14.4.2).

Note: If the keyword is <u>PEDATA</u>, then one has the further option of reading the formatted cards from a separate file (TAPE 4). To use this option, a card: <u>USE TAPE 4</u> must be the next card after the <u>TEMPORARY</u>, <u>PEDATA</u> card; then the formatted data should be on a file to be read by 1/0 unit 4.

There is no default for TEMPORARY.

4.5.5 RESET.

- (a) general form: RESET, keyword
- (b) Allowable keywords are as in section 4.5.3.
- (c) This card will reset the default conditions for the keyword chosen. Its use is mainly to undo an <u>OVERRIDE</u> or a <u>TEMPORARY</u> without having to use <u>NEXT CASE</u>, <u>RD</u> which might reset other defaults not desired.

Note: The effect of an OVERRIDE or TEMPORARY used on PEDATA or RANDOM OCCURRENCE DISTRIBUTION (RODIST) can be undone only by a RESET, a NEXT CASE, RD, or another OVERRIDE or TEMPORARY for the same data block.

The effect of an OVERRIDE or TEMPORARY for any other data block can also be undone by a card of the usual form for that data block's keyword (i.e., keyword, option word 1, option word 2, ----).

There is no default on the RESET card.

4.6 Comments.

4.6.1 General Remarks on Comments. The program allows three types of user comment cards to be included in the input. In addition, the program itself generates some comments under certain conditions. The program generated comments are detailed in sections 7.1 and 7.2.

User comments in the input card deck (or card image file) are identified by having "\$" (dollar sign) in the first one, two, or three columns of the card.

4.6.2 \$ Comments. Cards having a "\$" in column 1 but not in column 2 are user comment cards which are totally ignored by the program. When one is read, the program merely goes to the next input card and reads that.

This type of comment is provided only so that the user can leave reminders, separate sections of input, or otherwise label inputs without having an effect on program printouts.

4.6.3 \$\$ Comments. Cards having "\$" in columns 1 and 2 but not in column 3 are user comment cards which are reproduced within the current case's printout only.

The comment (contents of the card) will be reproduced (less the first two columns) with the symbols "** USER **" preceding it in the comment section of the case's printout. (See sample case, Appendix D .)

These comments should be used to note any special details about a case.

 $\frac{4.6.4}{\text{comments}}$ \$\$\$ Comments. Cards having "\$" in columns 1, 2, and 3 are user comments that are printed out immediately upon being encountered by the program. Again the symbols "** USER **" are appended to the front of the comment and the \$'s in columns 1-3 are removed.

These comments are printed on a special page separate from any case's printout. It was originally intended that "\$\$\$" comments be put at the beginning of the input before the FIRST CASE card; however, wherever they are put a special page will be printed containing them, and this page will occur in the printout immediately after the previous case's printout; or, (if there has been no case run yet) immediately after the title page.

4.7 DATA Statement Data.

There are many data which are set in data statements rather than read in from cards or disk file with each run or case.

As a general rule, these data are either labels (alphanumeric data) or numbers that do not change from run to run.

All of these data statements have been collected into the BLOCK DATA subprogram BDATA1. They are now described common block by common block:

- $\frac{4.7.1}{\text{ABRLBL}}$. This common block contains the abort labels (i.e., alphanumeric texts) that identify the abort causes on the printouts. They reside in the IDABRT array and are entered as Hollerith constants.
- 4.7.2 ACHAR. This common block consists of the CHAR array which contains the keywords used to input COPE case descriptors. Each keyword is entered as a string of Hollerith constants. In addition, corresponding to each keyword character string are two numbers, the first of which is the keyword number and the second of which is the number of distinct option word character strings allowed with that keyword. (Note: The second number as entered in the data statement line for each keyword is overwritten by numbers taken from the record named OPTNNUMS on the random access mass storage data base file. Thus, when the number of distinct optionword character strings allowed with a given keyword changes, there is no need to adjust the data statement; the pre-processor program PREPMS is used to adjust the value in OPTNNUMS to the correct value. (See section 14.5.)

Also, NREC, the total number of keyword character strings, is set in this common block's data statements.

 $\frac{4.7.3\ \text{DESRNG}}{\text{Model}}$. This common block contains the DESRNG array which consists of the default values for maximum designator range.

DESRNG (I, J) is the maximum designator range for designator type I under condition J where J=1 for day and J=2 for night.

- 4.7.4 DISPLY. This common block contains the DISPT, DISPM, RECLBL, and TMPLBL arrays, all of which are defined in the variable glossary (see chapter 12). Each of these arrays consists of alphanumeric constants entered as Hollerith data.
- $\frac{4.7.5\ \text{FLTTIM}}{\text{gives the default times of flight: TOFARY (I)}}$ is the COPPERHEAD time of flight for a gun-to-target range of I (currently only I=8 and I=12 are used).
- 4.7.6 FSRESP. This common block consists of the FSRT array which contains the FT Sill supplied response time distribution.
- 4.7.7 HEADNG. This common block contains the ACQLBL, DAYLBL, DFSLBL, DGTLBL, DOLBL, ROLBL, and RSPLBL arrays all of which are defined in the glossary of variables (chapter 12).

Each of these arrays consists of alphanumeric constants entered as Hollerith data.

4.7.8 LOGFLG. This common block contains various logical flags: FIRSTL, SEQNML, SPCL array, and SHRTEC all of which are defined in the glossary of variables (chapter 12).

These are all logical type variables.

- 4.7.9 POINT. This common block contains the IPOINT array used in Subroutine INPUT to direct control to various parts of a computed GOTO.
- 4.7.10 SMOKED. Only the SMK2 and SMK5 arrays plus the variable FRONT of this common block are filled in via data statements. They are all defined in the variable glossary (chapter 12).
- $\frac{4.7.11}{\text{STITLE}}$. This common block contains SLVERS and the VERDAT array. Both are used in the title page printout.
- 4.7.12 SYMBOL. This common block consists of the ALFBET, ANUMBR, and SEP arrays plus the single variables BLANK, DECPNT, and DOLLAR. They are all alphanumeric constants filled in as Hollerith data and defined in the glossary of variables (chapter 12).
- 4.7.13 XVALUE. This common block contains the XVALUE array which is used to generate PEDATA record names. (See sections 5.4 and 9.34.)

4.8 Side Effects of Certain Inputs.

 $\label{thm:controller} \mbox{There are a number of dependencies and side effects connected} \\ \mbox{with some of the inputs.}$

First, the choice of response time data (4.4.15) and mission code (4.4.8) together with time-of-flight determine the nominal response time. (Time-of-flight itself may be determined either by direct input (4.4.24) or as a result of the choice of gun-to-target range (4.4.35)).

The nominal response time, designator type (4.4.11), target velocity (4.4.21), angle T (4.4.25), gun-to-target range (4.4.35), reflectivity (4.4.36), deflection bias (4.4.37), target heading (4.4.38), and seeker sensitivity (4.4.39) are all used to determine the name of the PE data record (see section 5.4). Indeed, angle T, reflectivity, deflection bias, target heading, and seeker sensitivity play no other roles in COPE than to affect the PE data (by determining the PE data record name) and to appear on the case heading page (see section 6.3) for identification purposes.

The maximum designation range (4.4.22) depends on the time of day (day or night) input with response time data (4.4.15) and the designator type (4.4.11). The maximum designator range can also be set by direct input (4.4.22); however, the user must take care to see that the PE data as well as TTF and RNGTTF arrays contain values appropriate for the maximum designator range used.

The target velocity (4.4.21) can be input directly or as a result of the time of day (day or night) used for the response time data (4.4.15), the month used for weather (4.4.13), and the terrain type (4.4.14) used for acquisition data. (The VELTBL array may need adjusting if additional choices are allowed for acquisition data or weather.)

Finally, the weather data (4.4.13) has a strong side effect on the effectiveness of smoke when the SMOKE option (4.4.19) that plays a specified number of smoke rounds is used.

CHAPTER 5

5. PREPARING TO RUN COPE

Prior to running the main COPE program, it is necessary to run the preprocessor programs to create the word addressable mass storage data base file (TAPE 11). This chapter describes the role of each preprocessor, the structure of TAPE 11, and the interfacing of TAPE 11 with each of the programs by means of the record names.

5.1 Preprocessor Programs.

There are three programs that may be regarded as preprocessors to the main COPE simulation program. These three programs are called:

- (1) PREPMS which stands for preprocessor mass storage,
- (2) PRBLOS which stands for $\underline{prob}ability$ of $\underline{line}-\underline{o}f-\underline{s}ight$, and
- (3) PAM which stands for <u>probability</u> of seeker <u>acquisition</u> and round $\underline{maneuver}$.

More detailed information on PREPMS, PRBLOS, and PAM is included in chapters 14, 15, and 16 respectively of this report. In addition, more thorough documentation of PAM is to be published in a future separate AMSAA Technical Report.

As mentioned in chapter 4 of this report, much of the data used in each COPE case is grouped into eight data blocks. These data blocks are filled by reading records from TAPE 11 (except in the case of the TEMPORARY option described in section 4.5). The main purpose of the PREPMS program (and one of the purposes of the PAM program) is to fill values into the records on TAPE 11 in such a way that they are accessible to the main COPE program.

The PREPMS program is used to fill in records for data blocks for weather data, acquisition range data, response time data, direct fire suppression data, random occurrence data, target posture data, and invariant data. It can also be used to fill in records for PE (probability of engageme data, but this feature has never been used because the PAM program which generates PE data has been modified to write its results directly to TAPE II and the choice of record name has been entirely automated in this case. Finally, the PREPMS program is also used to establish and modify the option words allowed as choices with each keyword (described in sections 4.4.1 through 4.4.19 except for those optionword choices described as "a numerical value" in sections 4.4.18 and 4.4.19).

The PRBLOS program is used to calculate the probabilities of line-of-sight at various ranges. These values are then used in the random occurrence line-of-sight model. They are read from the PRBLOS printout and entered by hand as input to PREPMS. Because the PRBLOS program does not directly act on TAPE 11, it shall not concern us further in this chapter (see chapter 15 for complete discussion of PRBLOS).

The PAM program takes as input the parameter values describing the conditions under which probability of engagement is to be computed. It then computes the PE data values, creates a record name for its current block of PE data by encoding the input conditions according to a scheme also used in the main COPE program, and then writes the PE data to TAPE 11 under that record name.

5.2 Word Addressable Mass Storage Data Base File (TAPE 11).

The word addressable mass storage data base file (TAPE II) consists of the records containing the data to be used by each of the eight data blocks mentioned in chapter 4, the records of option words allowed with each keyword (applies only to keywords described in sections 4.4.1 through 4.4.19 and excludes any option words described as "a numerical value"), and a record called OPTNNUMS that records the number of option word character strings allowed for each keyword.

TAPE II is a CDC word addressable mass storage file using a name type master index. (This file type and the way it is interfaced with a FORTRAN program is explained in the CDC Fortran Extended Version 4 Reference Manual chapter 8, a section titled "Mass Storage Input/Output"). The important feature to note here is that this file type (with a name type master index) is organized as a set of records each consisting of one or more words of data and each having a unique record name of one to ten characters. This unique record name is set when the record is created and must be used by any program that either reads or modifies the record. It is by using the same system of record names in the COPE program as in the preprocessors PREPPE and PREPMS that the data records written by the preprocessors can be read by the main COPE program.

5.3 Record Names.

5.3.1 Weather Data Record Name. The record name of the data to be used in the weather data block (the WDATA array) has the form: mmmtttt021 where mmm are the first three letters of the name of the month of the weather data, tttt are four numbers giving the time of day (24 hour military time) of the weather data, and the 021 are three numbers signifying that WEATHER has keyword number 21.

Examples:

 $\frac{\text{JUN0600021}}{\text{June day at 0600 (6 AM)}}$ is the record name for weather data for a

SEP2200021 is the record name for weather data for a September day at 2200 (10 PM).

5.3.2 Acquisition Data Record Name. The record name of the data to be used in the acquisition range data block (the ACQDAT array) has the form: ACQDATnn22 where nn are two digits giving the number of the choice for option word 1 used with keyword 22 (section 4.4.14).

Examples:

ACQDATO122 is the record name of the acquisition range and LOS segment length data to be used when option word AVERAGE is used with keyword 22 (ACQRNGDIST)

ACQDAT0322 is the record name of the data to be used with OPEN terrain.

5.3.3 Response Time Data Record Name. The record name of the data to be used in the response time data block (RSPDAT array) is of the form: RSPDATnn23 where nn are two digits giving the number of the choice for option word 1 used with keyword 23 (section 4.4.15)

Examples:

RSPDATO123 is the name of the record containing the response time data to be used when the FTSILL option is selected.

RSPDATO223 is the name of the record containing the response time data for the STAUCH option.

Note: There is no data record corresponding to the PARAM choice for option word 1. This is because the PARAM choice for option word 1 causes the program not to require any of the data in the response time data block.

5.3 4 Direct Fire Suppression Data Record Name. The record name of the data to be used in the direct fire suppression data block (DFSDAT array) is of the form: DFSDATnn24 where nn are two digits giving the number of the choice for option word 1 used with keyword 24 (section 4.4.16)

Example:

<u>DFSDAT0124</u> is the record name for <u>HIGH</u> direct fire suppression data.

 $\underline{5.3.5}$ Random Occurrence Data Record Name. The record name of the data to be used in the random occurrence data block (RODATA array) is of the form: RODAVmTRNn where m is the target velocity in meters per second (obviously between 0 and 9) and n is the terrain type number (corresponds

to number of option word 1 on ACQRNGDIST card, i.e., 1 for AVERAGE, 2 for CLOSE, 3 for OPEN).

Example:

RODAV8TRN2 is the record name for the random occurrence data to be used when target velocity is 8 m/s and terrain type is 2 (CLOSE).

 $\underline{\text{Note}}$: The program is currently set up only for velocities of 2, 3, 5, 8, and 9. Furthermore, 2 and 8 are treated as 3 and 9 respectively when it comes to looking up RODATA and PEDATA.

5.3.6 Target Posture Distribution Data Record Name. The record name of the data to be used in the target posture data block (PSTDAT array) is of the form: PSTDATnn27 where nn is the number of the choice for option word 1 used with keyword 17 (section 4.4.12).

Example:

PSTDAT0127 is the record name for the target posture distribution used when FO POSITION is VANTAGE POINT.

Note: Keyword 17 (FO POSITION) and keyword 27 (TARGET POSTURE DISTRIBUTION) could each be used to control the choice of target posture distribution data, but only keyword 17 (FO POSITION) has been provided with optionwords and is the only one of the two explained in section 4.4.

5.3.7 Invariant Data Record Name. The record name of the data used in the invariant data block (AINVDA array) is of the form: AINVDAnn28 where nn is the number of the choice for option word 1 used with keyword 28.

Example:

AINVDA0128 is the record name for the invariant data used with the default (omitted) option word 1.

Note: The keyword INVARIANT is currently set up to accept no option words (other than a blank which is equivalent to the default).

 $\frac{5.3.8}{41}$ Option Word Record Names. For each keyword numbered less than $\frac{41}{41}$ (see section 5.3.9 for keyword numbers) there may be some option words that are not numerical values (see sections 4.4.1 through 4.4.19 for the current option word choices available with each keyword).

To create, modify, or add to the list of character strings that can be used with any keyword, it is necessary to run PREPMS with input specifying the keyword (in its abbreviated form of ten characters or less), the total number of option word character strings that can be used

with that keyword and the keyword number as well as the option word number, the option word choice number and the option word character string for each option word choice. The formatting of this data is explained in chapter 14, but an explanation of its meaning is provided by the sample input following:

OPTION WORDS, W, 10, 21

1, 2, JUNE

1, 2, J

2, 2, DECEMBER

2, 2, D

1, 3, 1400

1, 3, 14

2, 3, 0600

2, 3, 06

3, 3, 2200

3, 3, 22

where the first line indicates that option word allowable choices are being set for keyword \underline{W} (or $\underline{WEATHER}$), that ten optionword character strings are being input, and that \underline{W} (or $\underline{WEATHER}$) is keyword number 21.

Each of the next ten lines establishes a character string as a possible option word choice. For example, 1, 3, 1400 establishes 1400 as a character string corresponding to the first choice for option word 2 of any input line beginning with keyword W (or WEATHER). The first digit (1) indicates that 1400 is the first choice allowed, the second digit 3 indicates that 1400 is a choice allowed for the third item on the input line (recall that an input line is of the form: Keyword, option word 1, option word 2, - - -, option word n so that option word 2 is actually the third item on an input line), and, of course, 1400 indicates that the input character string to select option 1 for option word 2 is 1400. The fact that the next line is 1, 3, 14 means that 14 has the same effect (first choice for option word 2) as 1400. No more than two lines are allowed to be input with the same ordered pair (choice number, option word number + 1) under any given keyword (though one may input just one line for such a pair if desired).

The PREPMS program then places this option word information on a record whose record name is the keyword (\underline{W} in the case above). It is for this reason that the keyword used must be ten or fewer characters. Each keyword of length more than ten characters also has an abbreviated form (see the appropriate section of chapter 4 for each keyword; even some keywords of length less than ten characters have abbreviated forms). For example, the keyword $\underline{ACQUISITION}$ RANGE $\underline{DISTRIBUTION}$ is suitable for input to \underline{COPE} , but cannot be used as input to \underline{PREPMS} because it is too long to be a record name; instead, the abbreviated form $\underline{ACQRNGDIST}$ must be used when setting option words via \underline{PREPMS} .

The rule is always to use the abbreviated form of the keyword with PREPMS input (even if the long form of the keyword is itself ten or fewer characters) and to use either form with input to COPE. For keywords with only one form, use it as input to both programs.

Finally, for each new option word choice that is allowed, the user must consider what COPE will do when it encounters the new option word. In the case of option words that control the choice of records to be read from TAPE 11 into data blocks, the user must also have run PREPMS to add the possible data block records into TAPE 11. In our example above, input to PREPMS must have created records named JUN0600021, JUN1400021, JUN2200021, DEC0600021, DEC1400021, and DEC2200021 containing the weather data to be used with each of the possible option word combinations. For the case of option words that control program actions rather than select a data record name, it will usually be necessary to modify the program code so that it will "know" what to do when encountering a new option.

5.3.9 Keyword Numbers, Abbreviated Forms, Etc. The following table gives the current list of allowed keywords, each keyword's number, abbreviated form, and relevant notes. (This overlays some of the information in chapter 4, but it was felt desirable to have all the keywords listed in one place for quick reference; chapter 4, sections 4.4.1 - 4.4.38 are still essential for allowed optionwords and detailed effects of keywords). When two consecutive keywords have the same number, the second is the abbreviated form. (Recall that blanks may be arbitrarily inserted in (or removed from) keywords.) Notes are explained at end of listing.

Keyword Number	Keyword		Note	<u>s</u>
1	FIRST CASE	*1	Sec.	4.4.1
2	NEXT CASE	*2	Sec.	4.4.2
3	END OF CASE	*1	Sec.	4.4.3
3	END	*1	ı	1
4	END OF FINAL CASE	*1	Sec.	4.4.4
4	END F	*1	ı	ı
5	PLOT	*2	Sec.	4.4.5
6	OVERRIDE	*3	Sec.	4.5.3
6	OVERIDE	*3		п
7	TEMPORARY	*3	Sec.	4.5.4
7	TEMP	*3		Ħ

Keyword Number	Keyword	Notes
8	RESET	*3 Sec. 4.5.5
9	CONTROL	*2 Sec. 4.4.6
11	LINE OF SIGHT MODE	*2 Sec. 4.4.7
11	LOS MODE	*2
12	MISSION CODE	*2, *9 Sec. 4.4.8
12	MSN CODE	*2, *9 "
13	NUMBER OF DIFFERENT TARGET POSTURES	*2 Sec. 4.4.9
13	NUMD IFTGTP	*2 Sec. 4.4.9
14	TARGET TYPE	*2 Sec. 4.4.10
16	DESIGNATOR TYPE	*2, *9 Sec. 4.4.11
16	DESIGTYPE	*2, *9 "
17	FO POSITION	*4 Sec. 4.4.12
21	WEATHER	*4 Sec. 4.4.13
21	W	*4 "
22	ACQUISITION RANGE DISTRIBUTION	*4 Sec. 4.4.14
22	ACQRNGDIST	*4
23	RESPONSE TIME	*2, *4, *9 Sec. 4.4.15
23	RESPTIME	*2, *4, *9 "
24	DIRECT FIRE SUPPRESSION	*4 Sec. 4.4.16
24	DF IRESUPPR	*4
25	RANDOM OCCURRENCE DISTRIBUTION	*10
25	RODIST	*10
26	PEDATA	*10
27	TARGET POSTURE DISTRIBUTION	*10

Keyword Number	Keyword	<u>Notes</u>
27	TGTPSTDIST	*10
28	INVARIANT	*5 Sec. 4.4.17
31	RUMC	*6 Sec. 4.4.18
32	SMOKE	*7 Sec. 4.4.19
41	DO ARTILLERY PK	*8 Sec. 4.4.20
41	DOARPK	*8 "
42	TARGET VELOCITY	*9 Sec. 4.4.21
42	TGTVEL	*9 Sec. 4.4.21
43	MAXIMUM DESIGNATOR RANGE	*8 Sec. 4.4.22
43	MAXDESRNG	*8 "
44	BAIL OUT RANGE	*8 Sec. 4.4.23
44	BAIL OUTRNG	*8 "
45	TIME OF FLIGHT	*8 Sec. 4.4.24
45	TOF	*8 "
46	ANGLE T	*9 Sec. 4.4.25
47	DUST	*8 Sec. 4.4.26
48	PROBABILITY OF SUCCESSFUL VOICE TRANSMISSION	*8 Sec. 4.4.27
48	PRBVOCTRAN	*8 "
49	PROBABILITY OF SUCCESSFUL DIGITAL TRANSMISSION	*8 Sec. 4.4.28
49	PRBDGTTRAN	*8 "
50	ROUND IN FLIGHT RELIABILITY	*8 Sec. 4.4.29
50	RNDFLTREL	*8 "
51	TIME BETWEEN ROUNDS	*8 Sec. 4.4.30

Keyword Number	Keyword	Note	<u>s</u>
51	TBR	*8 Sec.	4.4.30
52	NUMBER OF REPLICATIONS	*8 Sec.	4.4.31
52	NUMREP	*8	н
53	NUMBER OF ROUNDS TO BE FIRED	*8 Sec.	4.4.32
53	NUMRNDS	*8	II
54	NUMBER OF VEHICLES PER TARGET	*8 Sec.	4.4.33
54	NUMVEHTGT	*8	II
55	DISTANCE BETWEEN VEHICLES	*8 Sec.	4.4.34
55	DISTBVEH	*8	н
56	GUN TARGET RANGE	*9 Sec.	4.4.35
56	GTRNG	* 9	11
57	REFLECTIVITY	*9 Sec.	4.4.36
57	REFLECT	* 9	II
58	DEFLECTION BIAS	*9 Sec.	4.4.37
58	DEFLB	* 9	II
59	TARGET HEADING	*9 Sec.	4.4.38
59	TGTHDG	* 9	II
60	SEEKER SENSITIVITY	*9 Sec.	4.4.39
60	SEEKSENS	* 9	II
61	PROBABILITY OF A CORRECT MESSAGE	*8 Sec.	4.4.40
61	PROBCORMSG	*8	II
62	PROBABILITY DO WARNED TO LASE	*8 Sec.	4.4.41
62	PROBDOWARN	*8	II

Explanation of notes:

- *1 These keywords do not take option words.
- *2 These keywords set certain flags or indices that cause the program to function in one of several alternate ways or else serve as indices for array "look-ups." Any increase in the number of options corresponding to one of these keywords might require code changes to COPE (at the least, redimensioning of some arrays) to specify the actions to be taken for the new options.
- *3 These keywords take other keywords (numbers 21 through 28) as their second fields (i.e., as the first item following the separator after the keyword). The items to be used in the second fields are built into the program in data statements (CHAR array) and any changes would require code modifications to COPE. (See sections 4.5.1 through 4.5.5)
- *4 These keywords set the names of records on TAPE 11 to be read into the program data blocks. Any increase in the number of options allowed must be accompanied by input to PREPMS creating the records with the names that would be called for if the new options were exercised. (See chapter 14.)

Also, keyword 23 takes some further option words which determine digital or voice communications and day or night visibility. If more options are allowed for these keywords, then code changes are required for COPE.

- *5 Currently takes no option words, but if option words were added, it would fall in the same class as keywords with note *4.
- *6 The addition of any new options for RUMC would require code changes to COPE.
- *7 The addition of any new options for SMOKE would require code changes to COPE.
- *8 These keywords all take numerical values for option word 1. Any numerical value that could be read in F10.4 format is allowable though for some option words negative values or values greater than 1.0 may cause program malfunction (as in the case when the value represents a probability). Any attempt to modify one of these keywords to accept options other than numbers would require program code changes in COPE.
- *9 These keywords affect the choice of the PEDATA record name to be used (see section 5.4). Any increase in the number of allowed choices here would require changing values in the XVALUE array (in both COPE and PAM) and then running PAM to create any new PEDATA records that may be called for as a result of these changes.

In short, one can see from the above notes that while it is easy to add new optionword choices for a particular keyword (by running the PREPMS program when necessary), it often requires code changes to COPE to make the new choices have the desired effect. About the only keywords for which options can be conveniently changed are those of notes 4, 5, and, to a lesser extent, 9.

5.4 PEDATA Record Names.

The record name for the PEDATA (probability of engagement data) to be used with a given case is a function of ten keywords and their associated optionwords (except, of course, when using the OVERRIDE or TEMPORARY keywords with PEDATA).

When the PAM program is run, nine parameters are input. The values of these parameters determine the record name of the PEDATA created by that run. When COPE is run, the same nine parameters are assigned values (as the result of keyword inputs or defaults), the same function for determining record name is applied, and the record with the resulting name is read from TAPE 11 and filled into the PEDATA data block.

Because there are only a finite number of ten character record names and because the record name depends on the values of nine different parameters, it is necessary to limit the choices allowed for each parameter. This section is devoted mainly to a description of the function that determines record name when given the nine parameter values and to the changes required to introduce a new allowed parameter value.

The nine parameters are:

- (1) nominal response time in seconds (determined by keywords 23 and 12),
- (2) designator type (determined by keyword 16),
- (3) target velocity (determined by keyword 42),
- (4) gun-to-target range (determined by keyword 56),
- (5) target reflectivity (determined by keyword 57),
- (6) angle T (i.e., angle between gun-target line and designator target line; determined by keyword 46),
- (7) deflection bias (determined by keyword 58),
- (8) target heading (determined by keyword 59),
- (9) seeker sensitivity (determined by keyword 60).

The values currently allowed are (by parameter number):

- (1) any time t in seconds such that 0.5 second \leq t <999.5 seconds
- (2) GLLD, MULE, LTD (which COPE and PAM call types 1, 2, and 3 respectively)
- (3) 2, 3, 5, 8, and 9 meters per second,
- (4) 8 and 12 kilometers,
- (5) .05, .10, .20, and .30,
- (6) 0, 25, 30, 60, 90, and 120 degrees,
- (7) -200, -100, 0, 100, and 200 meters,
- (8) -60, -30, 0, 30, and 60 degrees,
- (9) 24, 36, 48, 60, and 72 joules per square meter.

The record name function works as follows:

-First, it rounds the nominal response time (parameter one to the nearest integer (call the result t', then $1 \le t' \le 999$).

-Next, for each parameter 2 through 9, the function matches the parameter value to one of the allowed values. Say for the jth parameter, the value is found to match the Ijth allowed value (if no match is found, an error stop results).

-Next, the record name is made by converting t' to octal (call it t" where $lg \le t$ " $\le 1747_8$), by letting N_j = a function of I_j (usually I_j -1), and then defining

record name = $20053333xxxxN_2N_3N_4N_5N_6N_7N_8N_9$ in octal

where: 20053333 is octal for the alphanumeric "PE00", xxxx are the four octal digits of t" (possibly with leading zero(s) if t" is small enough), N2, ___, N9 are as defined above (note that when $1 < I_j < 8$, we have $0 < N_i < 7$ so that each N_i is but a single octal digit. It is for this reason that we shall never allow more than eight different choices for the value of any of the parameters 2 through 9).

The values allowed for each parameter 2 through 9 are to be found in the XVALUE array which is defined by data statements in both COPE and PAM (also, in PREPMS). In COPE, the data statement is in BDAT1, in PAM it is in subroutine PENAME, and in PREPMS it is in BDATA2.

The XVALUE array is set up so that XVALUE (I,J,K) is the Ith allowed value for the Jth parameter when K=1 and XVALUE (I,J,K) is the NJ value (as defined above a function of IJ with $0 < N_J < 7$) corresponding to the Ith allowed value of the Jth parameter when K=2.

Notes: (1) Because the first parameter (nominal response time) is allowed a wider range of values, the XVALUE entries with J=1are not used. (2) Because XVALUE is dimensioned XVALUE (8,9,2) and because not all parameters 2 through 9 actually use the maximum of eight different allowable values, those array spaces XVALUE (I,J,1) and XVALUE (I,J,2) for I greater than the number of allowable values for parameter J are filled with 0's and 8's respectively. Hence, if an NJ value of 8 were to occur, the program has made an invalid parameter value match and a stop with error message will occur. (3) The programs do not distinguish between target velocities of 2 and 3 m/s or between 8 and 9 m/s or between designator types MULE and LTD when it comes to PE data. (There are still distinctions made in other parts of COPE such as calculating current designator target ranges or looking up LDWSS probability of hit numbers as function of designator type). This failure to distinguish can be observed in the XVALUE array: the XVALUE (I,J,2) values are identical for target velocities of 2 and 3 m/s, for example.

To allow more choices for one of the parameters 2 through 9, one need merely modify the data statements defining the XVALUE array so that XVALUE (I, J, 1) with appropriate I and J has the new value and XVALUE (I,J,2) has the corresponding NJ (octal digit). This must be done in both COPE and PAM (and should be done in PREPMS to keep it current also). Then one must run PAM with the parameter combinations using the new allowed value(s) to create the PEDATA corresponding to the case(s) one intends to run in COPE with the new parameter values.

To allow a new choice for parameter 1, one needs merely run PAM with the new value for parameter 1 to create the PEDATA for the case(s) using the new nominal response time and the desired allowed values for the other parameters. Of course, nominal response times outside .5 seconds to 999.5 seconds are not allowed.

Note: The PREPMS program uses the XVALUE array only to decipher PE record names. That is, one can direct that program to list the PEDATA records currently on TAPE 11 and then decipher the PE record names and print the values of the 9 parameters to which each such record corresponds. It is for this reason that the XVALUE array data statement in PREPMS should be updated along with those in COPE and PAM whenever a new value is introduced for any of the parameters 2 through 9.

5.5 Control Cards for COPE and Its Preprocessors.

The appendixes A, B, C, and D at the end of this report include respectively, the control cards used to run PAM, PRBLOS, PREPMS, and COPE. They are explained in these appendixes and hence require no further explanation here. These control card sets, of course, apply only to BRL's computer system and would require minor changes for other CDC installations and major changes for non-CDC computers.

CHAPTER 6

6. OUTPUT

This chapter describes the normal COPE output prints. Special messages and diagnostic or error prints that may occur are described in Chapter 7.

The normal COPE output consists of four types of pages, three of which will always be present and one of which will be present only if one or more "\$\$\$" comments is included in the input.

The page types will ordinarily occur in this order:

Title Page
"\$\$\$" comment page (if present)
First case heading page
First case results page
Second case heading page
Second case results page

nth case heading page nth case results page

final case heading page final case results page

An additional "\$\$\$" comment page will occur following the results page of the last case whose END card precedes any "\$\$\$' comment card (or cards).

Each page type is now described in detail.

6.1 Title Page.

This page includes the program name, the names of the program author and the various contributors to the model design and data collection. In addition, it identifies the activity, division, branch, and section responsible for the model.

Of greater practical value, this page also includes the version number of the program and the date that version was created. Finally, the page gives the date and time of the current run of the program.

For an example, see Listing 6-1.

6.2 "\$\$\$" Comment Page.

This page merely lists the user's "\$\$\$' comments (see section 4.6.4) with the symbol "** USER **" to the left of each comment line. In addition, any program generated comments (see section 7.1) are listed with "**COPE**" to the left of each comment line.

EVALUATION PERFORMANCE OPFRATIONAL COPPERHEAD

-PRICRAM BY RICHARD SANDMEYER

-MODEL DEVELOPMENT AND DATA COLLECTION 8Y:

DAVID BARNHART JULIAN CHERNICK DIANA FREDERICK PICHARD SANDMEYER RICHARD SCUNGID MICHAEL STARKS

EDWARD STAUCH ANNIE YDUNG

-BASEO ON A PROPOSAL BY HERBERT FALLIN

-DOME AT THE REQUEST OF DAVID HARDISON (DUSA-OR)

UNITED STATES ARMY MATERIEL SYSTEMS ANALYSIS ACTIVITY

GROUND WARFARE DIVISION

SUPPORT WEAPONS ANALYSIS BRANCH

SYSTEMS EVALUATION SECTION

COPE VERSION 6.2 CURRENT AS DE 6 MARCH 1980 THIS RUN DONE DN 08/14/RO AT TIME 15.41.16.

LISTING 6-1 TITLE PAGE

For an example, see Listing 6-2.

6.3 Case Heading Page.

The first page for each case is the heading page. The heading page gives a description of the conditions in effect for the case whose results follow. In addition, the heading page contains a section for any "\$\$" comments (either user or program generated). The case heading page (Listing 6-3) begins with a line indicating the case number. The next line below that gives the number of replications (i.e., number of potential Copperhead missions generated and tested by the current case of the Monte Carlo COPE model).

The next area of the case heading page is broken up into nine boxes each of which is surrounded by asterisks and contains descriptors of one aspect of the current case. These boxes are now described one at a time.

Note: When an OVERRIDE or TEMPORARY option is in effect, the case heading information may be unreliable for those items connected with the data block for which the OVERRIDE or TEMPORARY is in effect.

In the special case of a PE data block input via the OVERRIDE option, the values given in the comment of section 7.2.6 take precedent over those in the case heading when it comes to determining PE data but not for other purposes (for example, velocity used for calculating designator-to-target range is the velocity printed in the TARGET box rather than that in the comment).

If in doubt, the user should look at the contents (Data Check) of TAPE 8 for the case in question (see section 7.6) to determine which values were actually used for various parameters.

- $\underline{6.3.1}$ TARGET. The first box is labeled "TARGET" and contains data describing the target. These data are:
 - (a) Target type
 - (b) number of vehicles in the target unit,
 - (c) mean distance between target vehicles,
 - (d) target velocity (speed)
 - (e) target heading (where a heading of zero means the target is moving along the gun-to-target line toward the gun. Angles are measured counterclockwise from this zero heading).
 - (f) target reflectivity.
- 6.3.2 FIRING INFO. Moving vertically down the page, one next finds the FIRING INFO box which gives various information about the firing

\$\$\$ \$\$\$ \$\$\$ \$\$\$ \$\$\$ \$\$\$ \$\$\$ \$\$\$ \$\$\$ COMMENTS FOR THIS SET OF CASES \$\$\$ \$\$\$ \$\$\$ \$\$\$ \$\$\$ \$\$\$ \$\$\$ \$\$\$ \$\$\$

** USER ** THIS COMMENT WILL APPEAR ON THE \$\$\$ COMMENT PAGE

LISTING 6-2 "\$\$\$" COMMENT PAGE

NUMBER OF REPLICATIONS*10000		化邻苯基苯甲甲甲甲甲甲甲甲甲甲甲甲甲甲甲甲甲甲甲甲甲甲甲甲甲甲甲甲甲甲甲甲甲甲甲
*************************************	***************************************	**************************************
TARGET	* OETECTS COMMUS AND PROC LINES *	
TYPE 1 **	* PRIORITY PRE-PLANNED TARGET ** * DIGITAL COMMO	* MONTH OF JUN * TIME OF DAY: 0600
	* DAY TIME * NOMINAL DESPONSE TIME * 106. SEC *	***************************************
* TARGET VELOCITY=3. M/SEC * * * TARGET HEADING* 0. DEGREES *	+ HOLLING CESSION DIGITAL TRAN - 915 * + PACH CORPECT MESSAGE = .975 *	*******************************
TARGET'S REFLECTIVITY* .10 *	* PROB OG WARNED TO LASE * .975 *	* TERRAIN AND LOS
** 安安安安安安安安安安安安安安安安安安安安安安安安安安安安安安安安安安安	*****************	Market Control of the
· 在公安市 希腊芬特拉特 李林林 李林林 李林林 李林林 李林林 李林林 李林林 李林 李林 李林 李林	*****	* CLUSE LEKKAIN * CONTINUOUS LOS ("SHODTING GALLERY")
FIRING INFO *	* DESIGNATOR *	************************************
* NUMBER OF ROUNDS PER ENGAGEMENT= 6 *	* * *	法 香香香香香香香香香香香香香香香香香香香香香香香香香香香香香香香香香香香香
* ROUNO RELIABILITY* .96 ** TIME BETWEEN ROUNDS* 20. SEC **	* HAXIMUN DESIGNATOR RANGE*7000. M *	* DBSCURANTS
* TIME OF FLIGHT* 31.0 SEC ** KM ** NOMINAL GUN-TARGET RANGE* 8. KM **	* BAIL-UUI KANCL-1200 * DESIGNATUR AT VANTAGE POINT *	
* ANGLE T*: 25° OEGREES **	* *************************************	* VOLUME OF SMOKE FIRED: 484 + 845 * PROB DUST KILLS MISSION* •37
*	**************************************	**************************************
水杨 雅	* OESIGNATOR SUPPRESSED *	
** WISC **	* PROB SUPPRESSED BY INOIRECT FIRE=.01 * * PROB SUPPRESSED BY DIRECT FIRE: HIGH *	
* DELTA T3 ASSUMED TO BE ZERO * * * CEELTA T3 ASSUMED TO JOULES/M**2 *	**************	

LISTING 6-3 CASE HEADING PAGE

\$\$

\$\$ \$\$ \$\$ \$\$ \$\$

\$\$ \$\$

\$\$ \$\$ \$\$ \$\$

COMMENTS

** CAPE ** IN PPLOT FOP. CASE 1 WITH IPPFG= 1 . NO PLOT PRODUCEO .

\$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$

of the COPPERHEAD round. These items are:

- (a) number of rounds fired per engagement,
- (b) round in-flight reliability
- (c) time between successive rounds
- (d) time of flight of round
- (e) nominal gun-to-target range
- (f) angle T (angle between target-to-gun line and targetto-designator line)
- (g) deflection bias (which is the minimum distance between the COPPERHEAD footprint centroid and the target's path).
- $\underline{6.3.3}$ MISC. The next box below the FIRING INFO is labeled MISC and contains miscellaneous data relevant to the case. These data are:
 - (a) either a note that DELTA T3 is zero (in which case RUMC (see section 4.4.18) is optimally chosen for each fire mission or a note that DELTA T3 is not assumed to be zero in which case RUMC is a fixed value for each fire mission.
 - (b) The value of RUMC (if DELTA T3 is not assumed zero; otherwise, this line is not printed.)
 - (c) The seeker sensitivity value used for the COPPERHEAD seeker in this case.
- 6.3.4 DETECT, COMMO, and PROC TIMES. The next box which is located at the top of the second column of boxes contains data pertaining to detection, communication, and processing times. These data are:
 - (a) The mission type
 - (b) The type of communication (i.e., digital or voice)
 - (c) day or night indicator
 - (d) nominal response time (which is the sum of the median communication and processing times and the time of flight)
 - (e) probability of successful digital communication link being established when needed (not printed when item (b) above is VOICE)

- (f) probability of successful voice communication link being established when needed (printed only when applicable see section 2.2.9)
- (g) probability of a correct message,
- (h) probability that the D.O. is warned to lase.

If the parameterized response time option is used, then the parameterized response time (which does not include time of flight) is listed in this box first.

- 6.3.5 DESIGNATOR. The next box gives information about the designator (both the soldier and the piece of equipment). This information consists of:
 - (a) designator type,
 - (b) maximum designator range,
 - (c) bail-out range
 - (d) designator location.
- $\underline{\text{6.3.6 DESIGNATOR SUPPRESSED}}.$ The next box gives information about suppression of the designator. This information is:
 - (a) The probability that the FO (D.O.) is killed by Red preparatory artillery fires.
 - (b) A label giving the level of direct fire suppression achieved by the target against the D.O.
- $\underline{\text{6.3.7}}$ WEATHER. The first box of the third column gives weather data. These data are:
 - (a) The month whose weather is being used in the current case,
 - (b) The time of day (on a 0 to 2400 clock) whose weather is being used in the current case.
- $\underline{\text{6.3.8}}$ TERRAIN AND LOS. The next box moving down has terrain and line-of-sight information. This information includes:
 - (a) The terrain type used for the acquisition range distribution and line-of-sight segment length distribution.
 - (b) The line-of-sight model used in the current case ("SHOOTING GALLERY" or "RANDOM OCCURRENCE").

- $\underline{\text{6.3.9}}$ OBSCURANTS. The final box gives data on obscurants (smoke and dust). These data are:
 - (a) Probability that smoke is sufficiently dense to kill a potential COPPERHEAD mission.
 - (b) Number of smoke rounds fired of types one and two respectively to obtain the level of smoke in (a) above. (This is printed only if smoke effects are played as a function of number of smoke rounds fired (see section 4.4.19).
 - (c) Probability that dust from RED HE artillery fire is sufficient to abort a potential COPPERHEAD mission.

6.3.10 "\$\$" Comment Section.

The final section of the heading page for each case consists of a comment section. This comment section includes both any user comments for this case as well as any program generated comments.

 $\qquad \qquad \text{If a case has no comments of either type, then the comment section} \\ \text{is omitted.}$

6.4 Case Results Page.

Following the heading page for a given case is the case results page. This page is labeled in such a fashion as to be almost self-explanatory (see Listing 6-4).

The page has one line corresponding to each mission abort condition and two lines for each round abort condition. A mission abort occurs whenever one of the tests that affect the entire potential COPPERHEAD mission is failed (see sections 2.2.2 through 2.2.11); a round abort occurs whenever one of the tests that affect the functioning of a single round is failed (see sections 2.2.12-2.2.20).

Beginning at the top of the results page, one finds the number of occasions, which is the number of potential COPPERHEAD missions sampled for the current case. This number should equal the number of replications on the heading page for the same case.

The first seven abort causes (or tests) are those which would prevent the D.O. from even attempting to employ COPPERHEAD against a target.

Each of these causes of abort has one line giving the following information:

- (a) The number of the abort cause (or test),
- (b) a label describing the cause of abort,

													•	345(3.45%) 702(50.85%)	0(0.00%) 357(100.0%)	144(1.44%) 357(59.66%)	13(0.13%) 213(93.90%)	29(0.29%) 200(85.50%)	0(0.00%)	49(0.49%) I71(71.35%)	64(0.64%) 122(47.54%)	58 ****		657 (78.54%)
													ĸ	242(2.42%) 702(65.53%)	0(0.00%)	164(1.64%)	9(0.09%)	46(0.46%) 287(83.97%)	0(0.00%) 241(100.0%)	43(0.43%) 241(82.16%)	96(0.96%) 198(51.52%)	102	1.02% 10.13% 14.53% 60.77% SN)= 10.07%	II
	10000(99.16%)	9916(95.81%)	9501(100.0%)	9501(100.0%)	9501(25.03%)	2378(62,70%)	1491(67.54%)	* * *	1007(93.05%)	937(97.76%)	916(82.64%)	757(92.73%)	4	151(1.51%) 702(78.49%)	0(0,00%) 551(100,0%)	183(1.83%) 551(66.79%)	16(0.16%) 368(95.65%)	55(0.55%) 352(84.38%)	2(0.02%) 297(99.33%)	54(0,54%) 295(81,69%)	128(1.28%) 241(46.89%)	113	1.13% 11.22% 16.10% 72.79% PROB(ATHP FHG/NCSN)=	NUMBER TESTED (2 NOT KILLED)
10000) ****	ED (% PASSED):	EO (% PASSED):	ED (Z PASSED):	ED (% PASSED):	ED (% PASSED):	ED (% PASSED):	HUMBER TESTEO (2 PASSED):	ATTEMPTED ENGAGEMENTS (1007) ****	EO (% PASSED);	HUMBER TESTEO (% PASSED):	EO (% PASSED):	ED (% PASSED):	702) *****	96(0,96%)	0(0.00%) 606(100.0%)	194(1,94%)	15(0,15%)	83(0,83%) 397(79,09%)	4(0.04%) 314(98.73%)	74(0.74%)	104(1.04%) 236(55.93%)	132	1,327 13,112 18,807 80,053	141 (1.41Z) NU
***** OCCASIONS (10000)	NUMBER TESTED	NUMBEP TESTED	MUMBER TESTED	NUMBER TESTED	NUMBER TESTED	NUMBER TESTED	HUMBER TEST	LTENPTED ENGAGE	NUMBER TESTED	HUMBER TEST	HUMBEP TESTEO	NUMBEP TESTED	***** SHOTS (62(0.62%)	0(0.00%) 640(100.0%)	173(1,73%)	16(0,16%)	61(0,61%) 451(86,47%)	1(0,01%)	83(0,83%)	159(1.59%) 306(48.04%)	147	1.47% 14.60% 20.94% 84.54% AATNP FHG)=	łı.
**	84(0.84%)	415(4.152)	0(0.007)	0(0.00%)	7123(71,23%)	887(8.87%)	484 (4.842)	A * * * *	70(0.70%)	21(0.21%)	159(1.50%)	55 (0.55%)	1	30(0.307)	15(0.152) 672(97.775)	176(1.762) 657(73.212)	20(0.20%) 481(95.84%)	54(0,543) 461(88,293)	1(0.012)	105(1.05%) 406(74.14%)	156(1.56Z) 301(48.17Z)	145	1.45% 14.40% 20.66% 88.777 PPGR(SHUT/ATHP	CASES IN WHICH DESIGNATOR KILLED
CAUSE OF ABORT	DESIGNATOP IN INDIRECT FIRE	TARGET BEYOND VISIBILITY RANGE	TARGET BEYOND DESIGNATOR RANGE	TARGET HOT DETECTED	SNOKE KILLED MISSION	PUST KILLED MISSION	PESIGNATOR BAILED-OUT PRF-COMM		COMMO OUT (BOTH VOICE & DIGTL)	FEROR IN TRANSMISSION	DESIGNATOR BAILED-OUT POST-COM	LOS LOST - NO FIRING	POUND NUMBER :	LOS LOST DURING MISSION NUNBER TESTED (% PASSED)	DESIGNATOR HOT WARNED IN TIME HUMBER TESTED (% PASSED)	NESIGNATOP IN DIPECT FIRE NUMBER TESTED (% PASSED)	ROUND RELIABILITY FAILURE NUMBER TESTED (% PASSED)	TARGET OBSCURED BY MINI-TERRN NUMBER TESTED (% PASSED)	POUND DID HOT ENGAGE TARGET NUMBER TESTED (\$ PASSED)	EGUND ENGAGED BUT DID HOT HIT HUHBFR TESTED (% PASSED)	ROUNG HIT BUT DID NOT KILL NUMBER TESTED (% PASSED)	***** KILLS	PROB(KILL/OCSN) = PROB(KILL/ATMP ENG) = PROB(LLSHOTT) = PROB(LOS) = PPOB(LOS) = 7.027.	DESIGNATOR SURVIVABILITY: CASES IN WH
	1	N	e	4	ī.	9	۷		۵	0	10	11		12	13	14	15	16	11	18	19			DESI

LISTING 6-4 CASE RESULTS PAGE

CAUSE OF ABORT

- (c) the number of times the test was failed,
- (d) the percentage of the total occasions that failed the test
- (e) The number of potential COPPERHEAD fire missions on which the test was performed, (this number is equal to the total number of potential COPPERHEAD fire missions minus the number of potential missions that failed prior tests).
- (f) The percentage of those potential COPPERHEAD fire missions on which the test was performed that passed the test.

Following the seventh abort cause is a line giving the number of attempted engagements. This is the number of replications (out of the total original number of potential COPPERHEAD missions) that passed the first seven tests and have, therefore, reached the point where the D.O. attempts to call for COPPERHEAD fire.

The next four cause-of-abort lines (abort causes numbers 8 through 11) consist of those tests that must be passed before the battery will fire a COPPERHEAD mission. Each of these abort causes has one line giving information as described in (a) through (f) above in this section.

Following the eleventh cause-of-abort line is a line giving number of shots. This is the number of replications for which the mission reached the point where the battery actually fired COPPERHEAD (i.e., the mission passed tests 1 through 11). The number of shots is the number of missions fired, not the number of individual rounds fired.

The final eight abort causes (numbers 12 through 19) are round aborts which have two lines each in the printout.

The first line of each round abort cause gives:

- (a) The number of the abort cause (test),
- (b) a label describing the cause of abort,
- (c) the number of times the test was failed for the first round,
- (d) the percentage of the total occasions for which the first round failed the test.

The line continues with items (c) and (d) repeated but for the second and subsequent rounds up to a total of NRF rounds (NRF<6).

The second line of each round abort gives

- (e) the number of COPPERHEAD mission first rounds on which the test was performed,
- (f) the percentage of those COPPERHEAD fire mission first rounds on which the test was performed that passed the test.

The second line continues with items (e) and (f) repeated but for the second and subsequent rounds of the COPPERHEAD fire mission.

Following the final (19th) abort cause line is a line giving kills. This line gives the number of replications for which the first round of the COPPERHEAD mission achieved a kill, the number of replications for which the second round of the COPPERHEAD mission achieved a kill, and so on through the final round of the COPPERHEAD mission.

Next, the printout gives a number of probabilities derived from the case just simulated: (these probabilities are printed as percentages).

The probability of kill given an occasion for the nth round of the fire mission is printed and is calculated by dividing the number of kills for the nth round by the number of occasions.

The probability of kill given an attempted engagement for the nth round equals the number of kills for the nth round divided by the number of attempted engagements.

The probability of kill given a shot for the nth round equals the number of kills for the nth round divided by the number of shots.

The probability of line-of-sight (LOS) for the nth round is the probability of having LOS when the round arrives (test 12) given that LOS existed immediately prior to firing (test 11). (Note: The preceding applies to the "shooting gallery" LOS model; for random occurrence, the probability of having line-of-sight for the nth round is just equal to the success rate of test 12).

The probability of shot given an occasion is the fraction of potential COPPERHEAD fire missions that actually reach the point where rounds are fired.

The probability of shot given an attempted engagement is the number of shots divided by the number of attempted engagements.

The probability of attempted engagements given an occasion is the number of attempted engagements divided by the number of occasions.

The final line of the results page gives information on designator survivability. This line gives the number of replications in which the designator was killed by direct fire from the target and the percentage of the total replications that number represents. The line also gives the number of replications for which the test of designator kill was performed and the percentage of those replications in which the designator was not killed.

Note: The number of kills shown on the results page differs slightly in its meaning depending on whether "shooting gallery" or "random occurrence" line-of-sight model is used. When "shooting gallery" is used, no attempt is made to account for multiple kills of the same target vehicle (i.e., the number of kills on the nth round is calculated under the assumption that the vehicle the round hit had not already been killed by a previous round).

When "random occurrence" is used, the number of kills on the nth round takes into account the number of vehicles surviving to the nth round.

This difference, of course, has no effect in comparing first round kills computed using the two differing LOS models. Furthermore, for round n there will be no effect from this difference in bookkeeping if (1) n \leq number of vehicles in the target, (2) distance between target vehicles/target velocity \leq time between rounds, and (3) the D.O. is assumed always to designate the front most target vehicle in view. In other cases, the results obtained by the two methods will have some differences attributable to the difference in bookkeeping between the two methods.

CHAPTER 7

7. PROGRAM GENERATED MESSAGES AND DEBUGGING PRINTS

The COPE program has been designed so that most of the common errors will cause the program to come to a stop and print an error message. Of course, it is not possible to anticipate every possible error and the user can expect occasionally to encounter a run that terminates with a dump or a system generated error message. However, the current version of COPE has been used for hundreds of runs now and has not terminated in anything other than the normal program termination or one of the anticipated error stops.

The messages generated by COPE can be divided into five classes:

- (1) program generated \$\$\$ comments,
- (2) program generated \$\$ comments,
- (3) special program print-outs of a warning nature that do not result in program termination
- (4) special program prints that occur with abnormal program terminations and which give information useful in locating the cause of termination.
- (5) STOP messages that are printed in the day file. (These STOPS include the subroutine or function name in which the stop occurs.)

The messages are now explained. They are ordered alphabetically (by first line) within each class. (Note that some messages include more than one line).

7.1 Program Generated \$\$\$ Comments.

YOU HAVE SEQUENCE NUMBERS IN COLUMNS 73-78 OF TAPE 5. THEY WILL BE REMOVED BY THE PROGRAM;
HOWEVER, IF THE TEMPORARY OPTION WAS USED TO READ IN ANY DATA, THE RESULTS MAY BE SUSPECT.

This message is generated in subroutine SEPREC and is part of a modification added to handle a Control Data peculiar problem. Users of COPE frequently create TAPE 5 (the file of case descriptors) using the CDC editor in its default FORTRAN format and then save the resulting file by the command \underline{SAVE} , \underline{LFN} (where \underline{LFN} is the local file name). The problem is that the editor then inserts sequence numbers in columns 73-78 of the saved file. Now one could easily avoid this problem by using \underline{SAVE} , \underline{LFN} , \underline{N} rather than \underline{SAVE} , \underline{LFN} (the additional \underline{N}

causing no sequence numbers to be saved). However, to avoid aborting runs in which sequence numbers are present, COPE was modified to check the first non-comment card (or card image) of file TAPE 5 for sequence numbers: if columns 73-78 are filled with numbers and columns 63-72 and 79-80 are blank, then the computer concludes that sequence numbers are present, issues the above comment, and ignores columns 73-78 on all cards of the current run.

As mentioned in the message itself, this ignoring of columns 73-78 could adversely affect the results if the TEMPORARY option is used, since that option quite likely has important information in columns 73-78. In this event, the file TAPE 5 should be created in the editor with 80 character lines (i.e., use CDC command \underline{F} ,CH=80 before creating the file). Then when it is saved, the sequence numbers will be in columns not read by the program.

For keywords other than TEMPORARY, there is not likely to be any adverse effect since the case descriptor character strings on the cards will usually terminate before column 63 and hence the deletion of columns 73-78 will have no effect.

Finally, if the computer should erroneously conclude that sequence numbers are not present when they really are (as could happen if any of columns 63-72 or 79-80 of the first non-comment card were not blank), then the computer would treat the sequence numbers as part of the keyword or optionword and a different error would bring the program to a halt when that keyword or optionword was not found (see section 7.4.5).

One may wish to remove this feature if using a non-CDC computer.

7.2 Program Generated \$\$ Comments.

DECDONCE TIME

7.2.1 CHOICE OF option word FOR RESPONSE TIME DATA IS INCONSISTENT WITH TIME OF option word FOR WEATHER DATA.

The first option word is $\overline{\text{DAY}}$ or $\overline{\text{NIGHT}}$ while the second one is $\overline{0600}$, $\overline{1400}$, or $\overline{2200}$.

This message merely warns the user that one of the following pairs of a RESPONSE TIME data option word and a WEATHER data option word is being used:

RESPONSE TIME option word	WEATHER option word
DAY	2200
NIGHT	0600
NIGHT	1400

These are all considered inconsistent pairs since daylight is usually gone by 2200. On the other hand, day light is usually present at 0600 and 1400.

The choice of one of these inconsistent pairs will not abort the program, but merely result in the generating of this message and the executing of the case with the inconsistent data selected.

7.2.2 IN CCPLOT FOR CASE nn WITH ICCPFG= 1. NO PLOT PRODUCED.

nn is the case number.

This message merely means that the user wanted a Cal Comp plot for case number nn, but since the plot routine is not yet implemented, no plot was produced.

7.2.3 IN PPLOT FOR CASE nn WITH IPPFG = 1. NO PLOT PRODUCED.

nn is the case number.

This message merely means that the user wanted a printer plot for case number nn, but since the plot routine is not yet implemented, no plot was produced.

7.2.4 NO ENDF CARD FOUND BUT ONE ASSUMED SINCE END OF INPUT FILE ENCOUNTERED.

This message occurs when no ENDF card has been put at the end of TAPE 5 (INPUT). It merely means that the program reached the end-of-file without encountering an ENDF card and then proceeded as though it had found one there.

7.2.5 NO 'FIRST CASE' OR 'NEXT CASE' CARD FOUND --- NEXT CASE, RD OPTION ASSUMED.

This message means that inputs for a new case (possibly the first case) have been encountered, but were not preceded by a 'FIRST CASE' or 'NEXT CASE' card. In this event, the program proceeds as though a NEXT CASE, RD card had been encountered prior to the new case's inputs.

7.2.6 PEDATA FOR: TR=xxx. DT= n VEL= yy. GTR= zzz. REFL= a.aa ANGLET= bbb. DEFT= ccc. TGTHD= dd. SKSEN= ee.

xxx., n, yy., zzz., a.aa, bbb., ccc., dd., and ee. are respectively the response time, designator type number, target velocity, gun-to-target range, reflectivity of target, angle T, deflection bias, target heading, and seeker sensitivity used to generate the PEDATA used in this run. This message occurs only when the OVERRIDE option is used with PEDATA.

The units used with each quantity are those normally used on the corresponding keyword cards.

7.2.7 RECORD NAMED: Record Name USED TO OVERRIDE FOR Data Block Name.

Here record name is the name of the record on the word addressible mass storage file that is selected by the OVERRIDE option and data block name is the name of the data block to be filled by this override.

This print occurs only with each data block in a given case for which the OVERRIDE is in effect.

7.2.8 TEMPORARY OPTION IN EFFECT FOR Data Block Name.

Here data block name is the name of the data block filled by use of the TEMPORARY OPTION.

This print occurs only with each data block in a given case for which the TEMPORARY option is in effect.

7.2.9 YOUR INPUT LINE: Input Line Characters SUPERSEDES ONE OF YOUR PREVIOUS INPUT LINES FOR THIS CASE.

The input line characters are the contents of the card that supersedes a previous line. This message is only a warning to the user that he has included two (or more) cards with the same keyword in a single case. When this happens, only the last such card has an effect on the choice of case descriptors.

If two PLOT cards (section 4.4.5) are included in a case (one for CALCOMP and one for PRINTER), then this message will be produced. In such a case, both plot types are set according to the input cards even though the message says the last one superseded the earlier one; this is the one case in which this message can be safely ignored.

In most cases, one will want to check the input cards and probably re-run the case so that no more than one card is used for each keyword. Note that an OVERRIDE or TEMPORARY card applied to a certain keyword counts as an input card with that keyword for purposes of this message (for example, putting an OVERRIDE, W, JUN1400021 card and a W, J, 0600 card in the same case will produce the message of this section).

7.3 Special Program Print-Outs of a Warning Nature That Do Not Result in Program Termination.

7.3.1 IN OUTPUT. PROBLEM 1 J= nnnnn RNDRED=xxxx. NKILL = mmmmm.

nnnnn is the number of the round, xxxx. is the number of kills on the Jth round for this case calculated by adding one each time a kill occurs, and mmmmm is the number of kills on the Jth round for this case calculated by subtracting the number of aborted missions and Jth rounds from the number of replications.

This print occurs only if the Jth round kills (J runs from 1 to NRF) computed by the two methods differ. It indicates a serious problem with the program.

7.3.2 SERIOUS PROBLEM! KTEST AND NTEST ARRAYS DO NOT AGREE II= nnnnn JJ = mmmmm KTEST ARRAY: (Followed By A 20 x 6 Matrix).

nnnnn is the abort number and mmmmm is the round number (or if nnnnn corresponds to a mission abort, mmmmm is 1).

 $\,$ II and JJ are the indices of the first entry in the KTEST and NTEST arrays that do not agree.

The 20 x 6 matrix is the KTEST array where the element in row I column J is KTEST (I, J). The NTEST array elements correspond to the 'number tested' values printed on the case results page where NTEST (I, J) corresponds to the Jth round Ith abort condition (when the abort is a mission abort, J=1).

The KTEST array is filled by incrementing KTEST (I,J) each time the Ith test is made for the Jth round (if the test is for a mission abort J=1). The NTEST array is filled by setting NTEST (I,J) equal to the number of replications minus the number of missions (and Jth rounds) aborted by tests 1 through I-1.

If NTEST and KTEST differ, then the program is not behaving correctly.

- 7.4 Special Program Prints That Occur with Abnormal Program

 Termination and Which Give Information Useful in Locating the Cause of Termination.
 - 7.4.1 ERROR IN INPUT. LINE: Character String WITH ITI=nnnnn IS IN ERROR.

The character string is the card image read from TAPE 5 (INPUT) that is in error and nnnnn is the keyword number.

The error occurs when a keyword match is found for the input, but no code has been provided to handle the input. This is a serious error and means that a program change is required.

This message corresponds to STOP in section 7.5.15.

7.4.2 IN COMMNT. TOO MANY \$\$ COMMENTS (>20): (Followed By 20 Numbered Lines of Comments, Then:) THE FOLLOWING COMMENT CAUSED OVERFLOW OF CMENT ARRAY: (Followed by a 21st Comment Line).

The CMENT array is dimensioned to allow up to 20 \$\$ comments per case. This message means that 21 \$\$ comments were generated for the current case and consequently the CMENT array overflowed. The \$\$ comment count includes both program generated and user comments.

The corrective action is either to reduce the number of comments for the case or increase the second dimension of the CMENT array.

 $\underline{\text{Note}}$: One possible cause of too many comments is the omission of one or $\underline{\text{more}}$ END cards.

This message corresponds to the STOP of section 7.5.1.

7.4.3 INPUT ATTEMPTED TO READ RECORD NAMED Record Name BUT NO SUCH RECORD WAS FOUND.

The record name is the name of the record which the program attempted to read from the word addressible mass storage file but which could not be found on that file.

This message means the desired record does not exist on the mass storage file. In order to create it, one of the pre-processor programs must be run. If the OVERRIDE feature was used, try preceding the record name with a \$ (dollar sign), as described in section 4.5.3.

This message is accompanied by a trace back print of the subroutines called to produce the message. This can be used to locate which call to READMS actually caused the abnormal termination.

This message occurs with the STOP in section 7.5.21.

7.4.4 IN FINDIT. KEYWORD: Keyword AND CORRESPONDING VALUE OF_IT: Value ARE NOT ALLOWED WITH THE Option Word OPTION.

Here keyword is the keyword character string, value is the keyword number, and option word is an option word character string.

This message occurs when one attempts to use OVERRIDE, TEMPORARY, or RESET features with an option word that is a keyword other than the name of one of the data blocks.

This message corresponds to the STOP of section 7.5.5.

7.4.5 IN FINDIT. NO MATCH FOUND FOR LINE IB= nnn OF THIS B ARRAY: (Followed By Up to 10 Lines of Character Strings).

Here nnn is the value of IB.

IB is the number of the character string for which no match was found. If IB=1, there was no keyword match (this corresponds to the stop of section 7.5.4). If IB=2, then one could be in the situation of the STOP of section 7.5.4, section 7.5.6 or section 7.5.7.

This error usually means the keyword or option word found in line IB was misspelled or does not exist.

7.4.6 IN NUMRIC. LINE nnn EXCEEDS ALLOWABLE FIELD LENGTH FOR NUMERIC DATA: (Followed By Up to 10 Lines of Character Strings).

Here nnn is the number of the line in the listing of character strings which contains a numerical string of more than 10 characters (including "-" sign and "." if present).

The corrective action is to change the number to one of less than 10 characters (when including "-" and "."). With the parameters used in COPE there should never be occasion to use a number requiring more than 10 characters.

(Note: If the number is written on input without a decimal point, then the program adds a decimal point after the last digit. Hence, if the decimal point is omitted the number should not exceed nine characters).

This error corresponds to the STOP of section 7.5.23.

7.4.7 IN NUMRIC. LINE nnn HAD TOO MANY DECIMAL POINTS: (Followed By Up To 10 Lines of Character Strings).

Here nnn is the number of the line in the listing of character strings which contains more than one ".".

The corrective action is to rewrite the input line so that no option word has more than one decimal point.

This error corresponds to the STOP of section 7.5.22.

7.4.8 IN SMPLCD WITH RANDOM NUMBER GREATER THAN 1.0 RN=xx.xxxxxxx.

Here xx.xxxxxx is the random number generated for use in SMPLCD.

This error will occur only if the random number generator malfunctions and produces a number 1.0. If this error occurs, a trace of subroutine calls is produced and the STOP of section 7.5.31 occurs.

7.5 STOP Messages That are Printed in the Dayfile.

7.5.1 STOP IN COMMNT: TOO MANY \$\$ COMMENTS. This message occurs when too many \$\$ comments are encountered in one case. See section 7.4.2.

- 7.5.2 STOP IN COPE: NORMAL PROGRAM TERMINATION. This is the desirable stop message. It means that the program terminated after processing all the inputs and that no abnormal stopping conditions were encountered. Of course, it does not guarantee that the program did what the user expected, and there may be some warning diagnostic messages (of types 1, 2, or 3 above) produced.
- 7.5.3 STOP IN DFCHK: ERROR NUMBER 1. This stop occurs when the designator-to-target range cannot be bracketed by the range values in the DFFOKL array. This indicates either an error in the range calculation or a need for larger range values in the DFFOKL array.
- 7.5.4 STOP IN FINDIT: ERROR NUMBER 1. This message means that a search of the CHAR array has found no keyword to match that of the current input card. (If the $\underbrace{\text{OVERRIDE}}$, $\underbrace{\text{TEMPORARY}}$, or $\underbrace{\text{RESET}}$ option is used, then this message will also occur if the second character string on the card cannot be matched from the CHAR array).

This stop corresponds to the print-out of section 7.4.5.

7.5.5 STOP IN FINDIT: ERROR NUMBER 2. This message occurs when one attempts to use the OVERRIDE, TEMPORARY, or RESET option with anything other than one of the eight data block names. (See section 4.5.)

See section 7.4.4.

7.5.6 STOP IN FINDIT: ERROR NUMBER 3. This message occurs when no match for a given option word from an input card can be found among the allowable option words for the input card's keyword.

See section 7.4.5.

- 7.5.7 STOP IN FINDIT: ERROR NUMBER 4. This message means the same as that in 7.5.6, but occurs at a different point in subroutine FINDIT.
- 7.5.8 STOP IN FPRCNT: ERROR NUMBER 1. This message means that function FPRCNT was called to format into a percentage a number greater than or equal to 100.05. There should never be any percentages greater than 100 in this program, so if this message is obtained, there are major problems in the bookkeeping processes. In particular, the NABORT array and NTEST array are probably filled with wrong numbers.
- 7.5.9 STOP IN GETRNG: TARGET VELOCITY = 0.0. This message means a target velocity of zero was input. This is not allowed since division by zero in calculating line-of-sight duration would cause division overflow on the computer.

If one really wishes to use zero velocity, it is suggested that one use a velocity of, say, .001 which will create line-of-sight durations so great that the end result will not differ significantly from those of a stationary target.

A subroutine call trace is also produced.

7.5.10 STOP IN GETVIS: RANDOM NUMBER TROUBLE 1. This message means that the attempt to sample weather data failed under cloud free line-of-sight conditions.

This probably means that there is an error in the PRGCFL array or the random number generator is malfunctioning.

A subroutine call trace is also produced.

7.5.11 STOP IN GETVIS: RANDOM NUMBER TROUBLE 2. This message means that the attempt to sample weather data failed under no cloud free line-of-sight conditions.

This probably implies that there are invalid numbers in the W array or the random number generator is malfunctioning.

A subroutine call trace is also produced.

 $\frac{7.5.12}{\text{OVER}}$ STOP IN HEADER: ERROR NUMBER 1. This error occurs only if IOVER (J) has a value other than 0, 1, or 2 for a value of J = 21, 22, 23, 24, 25, 26, 27, or 28.

This should never happen. If it does there is a serious problem somewhere in the input or the random access mass storage file.

- 7.5.13 STOP IN HITCHK: FAILED TO BRACKET RANGE. This stop occurs when the designator-to-target range cannot be bracketed by the range values in the RNGPST array. This indicates either an error in the range calculation or a need for longer range values in the RNGTTF array.
- 7.5.14 STOP IN INPUT: EOF ENCOUNTERED. This stop occurs when an end-of-file is encountered on TAPE 5 after an END card (instead of after the expected ENDF card).
- 7.5.15 STOP IN INPUT: ERROR NUMBER 1. This stop corresponds to the message of section 7.4.1.
- 7.5.16 STOP IN INPUT: EXTRA NEXT CASE CARD. This stop occurs when two (or more) NEXT CASE cards occur within the same case (i.e., without an intervening END card). The program will not accept more than one NEXT CASE card per case. (All cards lying between consecutive END cards are considered to form a case. For this purpose, the beginning and end of TAPE 5 may both be regarded as END cards.)
- $\frac{7.5.17}{\text{STOP}}$ IN INPUT: FIRST CASE CARD IN SUBSEQUENT CASE. This stop occurs if a FIRST CASE card is encountered anywhere on TAPE 5 other than in the first case. Cases other than the first case should be headed by NEXT CASE cards rather than FIRST CASE cards.

- 7.5.18 STOP IN INPUT: PARAMETERIZED RESPONSE TIME ≤ 0.0 . This stop occurs when attempting to play a parameterized response time less than or equal to zero. Such times are not allowed in the program.
- 7.5.19 STOP IN LOSCHK: ERROR WITH RANDOM OCCURRENCE OPTION. This message means that the designator-to-target range cannot be bracketed by the range value in the RNGPLS array. This indicates either an error in the range calculation or a need for larger range values in the RNGPLS array.
- 7.5.20 STOP IN MINTRN: FAILED TO BRACKET RANGE. This stop occurs when the designator-to-target range cannot be bracketed by the range values in the RNGPST array. This indicates either an error in the range calculation or a need for larger range values in the RNGPST array.
- 7.5.21 STOP IN NOREC: ATTEMPTED TO READ NON EXISTENT RECORD. This stop corresponds to the message of section 7.4.3.

A subroutine call trace is also produced.

- 7.5.22 STOP IN NUMRIC: ERROR NUMBER 1. This stop corresponds to the error message of section 7.4.7.
- 7.5.23 STOP IN NUMRIC: ERROR NUMBER 2. This stop corresponds to the error message of section 7.4.6.
- 7.5.24 STOP IN PECHK: FAILED TO BRACKET DELTA T. This message means that the time delay cannot be bracketed by the DLTT array time values. This indicates either an error in calculating DELTAT or a need for larger time values in the DLTT array.
- 7.5.25 STOP IN PENAME: ERROR NUMBER 1. This stop means that one of the input values that determines which PEDATA record is to be used had a value not found in the XVALUE array. (See section 5.4.)
- 7.5.26 STOP IN PENAME: ERROR NUMBER 2. This stop means that an illegal index value was assigned to NP in subroutine PENAME. (See section 5.4.)
- 7.5.27 STOP IN PENAME: ERROR NUMBER 3. This stop means that a response time less than zero or greater than or equal to 999.5 was input. This is outside the allowable range of response times.
- 7.5.28 STOP IN PENAME: (PEIDNT) ERROR NUMBER 4. This stop means that the PEDATA record name could not be decoded successfully. (See section 5.4.)
- 7.5.29 STOP IN SEPREC: ERROR NUMBER 1. This error occurs only if the number of keywords and/or option words on an input card is greater than 10 or less than or equal to zero.

7.5.30 STOP IN SMPLCD: FAILED TO BRACKET RANDOM NUMBER. This stop occurs when the random number obtained from the uniform random number (0 to 1) generator cannot be bracketed by the cumulative probability values describing the distribution to be sampled. It indicates either a malfunctioning random number generator or an incomplete description of the distribution to be sampled.

A subroutine call trace is also produced.

7.5.31 STOP IN SMPLCD: RANDOM NUMBER TOO LARGE. This stop corresponds to the error message of section 7.4.8.

A subroutine call trace is also produced.

7.6 Echo Printing.

The COPE program uses TAPE 8 (i.e., logical output unit 8) to echo inputs, to print the values of the case parameters, and to print the initial random number seeds. TAPE 8 is normally a scratch file that is lost when the job is completed; however, if one wishes to see the contents of TAPE 8 for debugging or verification purposes, then one need merely list it or catalog it for future reference.

A sample of TAPE 8 contents is shown in Listings 7-1 and 7-2.

For each case that is run there are two sections of output on TAPE 8. The first section is a listing of the input options (i.e., the case descriptor cards on TAPE 5) that apply to the case.

The second section (Data Check) displays the values of most of the data that describe the case. This section includes data from the word addressable mass storage file (or its equivalent obtained by using the TEMPORARY option), data obtained directly from INPUT cards, and a few computed values. Together, these data give the complete numerical description of the case to be simulated. (This echo print data check has two forms, a long form and a short form. The long form gives all of the data describing the case; the short form gives it all except the PEDATA (i.e., the INDEX and PETBL arrays). (See section 4.4.6.)

Listing 7-1 gives an example of what is printed on TAPE 8 when the short form of the echo print is used. Listing 7-2 shows the TAPE 8 printout when the echo print long form is used.

The values listed in the Data Check section of the TAPE 8 printout are not identified by any printout labeling. Instead, the user must locate the value of a particular variable on the printout by matching the printout lines with the WRITE statements in subroutine ECHO. If the user intends to use this Data Check section frequently, then perhaps some labeling should be added.

In addition to the two sections of output for each case, TAPE 8 also includes the random number seeds. These are printed immediately following the first case data check. Since the random number seeds used for each case are the same, the print of random number seeds is not repeated following the data check prints for subsequent cases.

Note that the column numbers at the top and bottom of each page of Listings 7-1 and 7-2 are not part of the output produced on TAPE 8. They are included here only for the reader's convenience.

LISTING 7-1 SHORT FORM OF ECHO PRINT

(PAGE 1 OF 3)

1100.0000 1520.0000 160000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

280.0000 420.0000 310.000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

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140.0000 1150.0000 210.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

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70.0000 140.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

50.0000 100.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

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- CONT'D ECHO PRINT LISTING 7-1 SHORT FORM OF

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69.1900		69.1900	69.1900	46.3200	46.3200	46.3200	46.3200			
00000	000000	00000	0.0000	0.000	0.0000	0.000	0.000			
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75.0000	~	75.0000	75.0000	75.0000	75.0000					
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27769185	20826889	32397383	57852469	57852469 60166567	115/0493	7804444	6504767			

LISTING 7-1 SHORT FORM OF ECHO PRINT - CONT'D

(PAGE 3 OF 3)

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1	. 9600			1		.0040	.0040	0.000	000000	0.000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	000000	.0150	.0040	000000	0.0000	000000	000000	0.0000	0.0000	000000	.0040	0.0000	.0040		.4440	.2700			
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LISTING 7-2 LONG FORM OF ECHO PRINTS

(PAGE 1 OF 17)

(PAGE 2 OF 17)

LISTING 7-2 LONG FORM OF ECHO PRINTS - CONT'D

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9999999900 2345678901	3700.000 1.0000 3700.0000 100000 500.0000 1100.0000 590.0000 1520.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	00000°0
18888888899 2345678901	3000 0000 280 0000 420 0000 0000 0000 000	00000.000000000000000000000000000000000
777777788 234567890 <u>1</u>	2500,0000 180,0000 200,0000 240,0000 0,0000 0,0000 0,0000 0,0000 0,0000 0,0000	0000°0 0000°0 0000°0
6666666677 234 <u>5</u> 678901	2000.0000 140.0000 150.0000 210.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	3001.0000 0.0000 0.0000 0.0000 0.0000
555555566 2345678901	1600 0000 1500 0000 120 0000 170 0000 190 0000 0 0000 0 0000 0 0000 0 0000 0 0000 0 0000 0 0000	2000.0000 3000.0000 .2000 .1000 .0100 60.0000
13333333344444445555555556666666667777777778888888888	3000 . 4000 3000 . 3000 50,000 70,000 50,000 70,000 100,000 140,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000	2000,0000 .2000 .0100 0.000
333333344 2345678901	3000 3000 3000 50.0000 100.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	1500.0000 .0500 .0500 .0000 FEOOAlAAJS
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1111111122	3 .1000 400.0000 30.0000 30.0000 40.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 1.0000 2.0000 2.0000	00.0000 0.5000 0.5000 1.4 F.E.C. II I I I I I I I I I I I I I I I I I I
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47 48 49 50 0EX ARRAY 51 52 53 54 55 56 57 58 ARRAY FÜR		4	3200 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000	K	.9800 .3400 .3400 .9600 .9600 .9900
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LISTING 7-2 LONG FORM OF ECHO PRINTS - CONT'D

(PAGE 3 OF 17)

0.0000 0.0000 0.2800 7100 7600 7800 7500 0.0000 0.0000 0.2200 6500 7100 7400 6500 7400 0.0000 0.0000 0.0000 .1100 .3000 .4500 .3200 .2800 0.0000 .3200 .2600 .3600 .3900 .3700 .0800 0.0000 00000 .9500 .9700 .9600 0.0000 0.0000 0.0200 3100 4100 3100 2900 4300 3800 0.0000 0.0000 .1100 .5700 .7200 .7800 .6600 .7600 .7600 0.0000 0.0000 1600 .5400 .6700 .7100 .7500 .7300 0.0000 .3600 .9700 .9800 .9600 .9500 000000 0.0000 0.0000 . 2600 . 7200 . 7300 . 7000 . 6900 . 6900 0.0000 0.0000 0.0700 .3600 .3200 .3400 .3600 0.0000 0.0000 .1100 .3500 .4100 .3500 .3800 0.0000 .9600 .9800 .9700 0.0000 .2900 .6900 .7200 .7100 .6600 .7700 0.0000 0.0000 .0000 .1100 .8000 .7400 .7100 .7500 .7300 .2300 .4000 .4500 .3700 .2800 .3800 00.0000 .5300 .7400 .7100 .6000 .6700 .6700 .7400 0.00000 .3500 .3100 9400 9500 9700 0.0000 000000 0.0000 .0700 .3900 .3500 .4100 .4100 .4200 .4600 0.0000 .2600 .7500 .7300 .7600 .6800 .6500 .7100 .3400 .3400 .3500 .4200 .3200 .2600 .2600 .7200 .7200 .7400 .7300 .6800 .6900 000000 .9500 .9700 .9700 00000 .0700 00000 1= 5 0.0000 0.0000 0.0000 0.550 0.650 0.850 0.850 0.850 0.850 .4200 .4700 .4700 .4100 .3800 .3800 .3700 000000 0.0000 .2100 .3900 .4100 .3100 .9400 .9800 .9400 .9600 .5200 .6000 .7200 .6800 .8100 .7100 .4300 .2800 0.0000 0.0000

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- CONT'D LISTING 7-2 LONG FORM OF ECHO PRINTS

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0.0000	0.0000 0.0000 0.0000 0.0000 0.0500 0.0500 0.0500	. 04000 0.00000 0.00000 0.10000 1.00000 1.00000 1.00000	0.0000 0.0000 .2400 .9700 1.0000 1.0000 1.0000	0.0000 0.0000 2.2800 .8800 .9800
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0.0000 .0100 .0600 .0500 .0500 .0400 .0400	00.00 00.00 00.00 00.00 00.00 00.00 00.00 00.00 00.00 00.00	0.0000 0.0000 0.0000 0.0000 1.0000 1.0000 1.0000	0.00000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000	0.0000 .0100 .8800 .0800 .0500
. 0100 . 0300 . 0700 . 0300 . 0200 . 0400 . 0300	0.000 0.0000 0.0100 0.0700 0.0200 0.0200 0.0200	0.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000	0.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000	0.0000 .4700 .9500 .0700 .9500
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LISTING 7-2 LONG FORM OF ECHO PRINTS - CONT'D

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	. 9500	9700	,	0.0000	2000	0050	0080	00.0		0000	0086.	00/0	0036.		00000	00000	. 2900	00.9.	.7200	.7100	.6600	• 7700	• 6700	.7100		000000	000000	22000	7200	0002	0009	. 7000	. 6600	0069.		00000	0.0000	0010.	0000	4200	0026.	3400	.3700	.3600	. 46.00	0000	0000	000000
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LISTING 7-2 LONG FORM OF ECHO PRINTS - CONT'D

(PAGE 6 OF 17)

0.0000 .0800 .3200 .3600 .3600 .3700	000000000000000000000000000000000000000		. 0400 0.0000 0.0000 0.0000 1.7000 1.0000 1.0000 1.0000	0.0000 0.0000 0.0000 1.0000 1.0000
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.1100 .3700 .3600 .3300 .4100 .3500	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	00000 000000 000000 000000 00000 00000 0000	. 0200 0.0000 0.0000 . 6600 1.0000 1.0000 1.0000 1.0000	0.0000 0.0000 1.0000 1.0000 1.0000 1.0000 1.0000
.1600 .3500 .3100 .3100 .3400 .3700	00000 00000 00000 0000 0000 0000 0000 0000	00000 00000 00000 00000 00000 00000 0000	. 0300 0.0000 0.0000 . 9900 1.0000 1.0000 1.0000 1.0000	0,0000 0100 0100 1,0000 1,0000 1,0000 1,0000
.3300 .3400 .3500 .4200 .3200 .2600	0.000 0.0100 0.0300 0.0300 0.0200 0.0400 0.0300	0,0000 0100 0100 00200 00700 00200	00000 5000 1,0000 1,0000 1,0000 1,0000 1,0000 1,0000	0.0900 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000
.4200 .3800 .4700 .4500 .4100 .3800 .3100 .3500	0.00 0.00 0.00 0.00 0.00 0.00 0.00	E 0		I = 22 0.0000 1.0000 1.0000 1.0000 1.0000 1.0000
. 4700 . 3300 . 3700 . 3100 . 3600 . 3600 . 3600	.	A.0		ARRAY FOR . 3200 . 9900 1.0000 1.0000 1.0000 1.0000
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LISTING 7-2 LONG FORM OF ECHO PRINTS - CONT'D (PAGE 7 OF 17)

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1.0000	0.0000	0.0000	. 9700	0096	0086.	0000	9700		0.000	0.000	00000	.6800	0096.	0096.	• 9500	0026*	9996	. 4800	0000	00000	000000	• 2800	. 7100	.7600	.7800	2500	7.500	•	0.0000	0.000	0000	.2200	0049.	. 1100	0044	0002		0067.	0.000	00000	0000 0		00000000000000
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LISTING 7-2 LONG FORM OF ECHO PRINTS - CONT'D

(PAGE 8 OF 17)

.1100 .3000 .4500 .3200 .4000	0.0000 0.0000 0.0000 0.0000 0.3200 0.3500 0.3500 0.3700	00 00 00 00 00 00 00 00 00 00 00 00 00	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	0.0000 0.0000 0.0000 1.0000 1.0000 1.0000 1.0000
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.3600 .3200 .3400 .3700	0.0000 0.0000 0.0000 1100 13700 14100 1500	000000000000000000000000000000000000000	000000000000000000000000000000000000000	0.0000 0.0000 0.0000 1.0000 1.0000 1.0000
.4000 .4500 .4100 .3700 .2800	0.0000 0.0000 0.0000 0.1600 0.3100 0.3400 0.3400	00000 00000 00000 00000 00000 00000 0000	00000 00000 00000 00000 00000 00000 0000	0.0000 0.0000 0.0000 0.0000 1.0000 1.0000
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LISTING 7-2 LONG FORM OF ECHO PRINTS - CONT'D (PAGE 9 OF 17)

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LISTING 7-2 LONG FORM OF ECHO PRINTS - CONT'D

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LONG FORM OF ECHO PRINTS - CONT'D LISTING 7-2

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0.0000 0.0000 0.0000 .7000 .7100 .7200 .6700 0.0000 0.0000 .6200 .7200 .6800 .6600 0.0000 0.0000 0.2800 .2700 0.0000 0.0000 0.0000 . 7000 . 8700 . 8400 . 9100 . 9200 0.0000 0.00000 0.00000 0.0000 0.9300 0.9400 0.9400 000000 0.0000 2500 7200 7600 7600 7600 7400 7300 7300 0.0000 0.0000 .2800 .7700 .7000 .8200 .6300 .6300 .1600 .2°00 .2800 0.0000 0.0000 .2400 .9300 .9300 .9500 .9500 0.0000 0.0000 11000 8700 9000 9300 8800 8700 0.0000 0.0000 0.0000 0.0000 .7700 .7200 .7200 .7200 .7400 .7400 0.0000 0.0000 .6600 .8700 .8300 .8300 .9400 .6900 .6500 .7000 .7100 .7300 .2900 0.0000 0.0000 0.0000 0.0000 0.0100 0.0100 0.0100 0.0000 0.0000 0.000 0.0000 .00000 .8500 .9400 .9400 .9400 .9400 .8400 0.0000 .0100 .7300 .7000 .6700 .7100 .7200 .7200 .3300 .6900 .7500 .7500 .6300 .6500 0.0000 .0100 .0500 .0300 .0400 .9300 .9300 .9300 0.0000 000000 00000 0.0000 .4700 .6700 .6800 .7700 .6900 .6700 .3200 0.0000 .5000 .9400 .9300 .8200 .9000 .8500 .8700 .6400 .8000 .7600 .7700 .6600 .7300 .4700 .9100 .9500 .9400 .9100 .9200 . 4000 0.000 000000 0000.0 0.0000 .7700 .7700 .7400 .6500 .7300 .7300 .7000 0.0000 .2600 0.0000 .6600 .7100 .6700 .6200 .8100 .7000 42 0.0000 .8900 .9300 .9300 .9100 .9100 .9100 41 • 8900 • 8700 • 8000 • 9000 • 8800 • 9300 • 8600 . 9300 . 9100 . 9100 . 9100 . 9100 . 9100 . 9100 . 4000 . 7100 . 7200 . 7200 . 7400 . 7400 ARPAY FOR 9300 APPAY FOR .3400 .6800 .6800 .6800 .7400 .6500 .7500 .7200 .2700 2900 .3200

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LISTING 7-2 LONG FORM OF ECHO PRINTS - CONT'D

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.2800	.2900	.3400	.3900	2700	3300	34.00	
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.2800	.3200	.2600	3200	3800	2000	2400	
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	0004.	0077	.3000	0012	.3600	• 2300	
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.1500	.1000	• 0800	.1000	.0700	.0200	0.000	
.1000	.1100	.1000	.1200	.1300	1100	1100	
0060.	.0700	.1800	.1500	0000	1500	0200	
.1200	.1100	.0500	.1300	.1400	0020	0800	
.1400	0060	.1000	.1100	1100	0800	0020	
.0400	0060	0050	0800	0080	1200	1100	
.0700	.1200	1400	1200	0000	0001	0020	
.1200	0090	1600	1000	1500	1100	0040	
PE ARPAY FOR	82		4	30.7	2077.	0000	
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0000	.1800	0200	0.0000	0000	0000	0000	
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1000	0700	1300	0000	0000	0070.	0000	
1000	0001	0000	0001		0000.	0000	
0000	0001	0000	0021.	0601.	0011.	00/0	
0000	0001.	0061.	0071	00400	•1200	.0500	
00400	0080.	.0300	0000.	0000.	.1000	0020.	
• 1000	.1300	• 0200	.0500	0000.	.1600	0000	
.1200	.0300	.0700	0090*	.0700	.1300	.1200	
.1200	0020.	.1000	0090	.0700	0000	0090	
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LISTING 7-2 LONG FORM OF ECHO PRINTS - CONT'D

(PAGE 15 OF 17)

000000000000000000000000000000000000000	000000011111111222222223333333334444445555555556 6666667777778 88888888889999999900000000111	<u> 34.66.78.901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012</u>	
000000000000000000000000000000000000000	222222233333333333444	234567890123456789012	
000000000000000000000000000000000000000	20000001111111122	34.56.78901234.5678901	

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		000000000000000000000000000000000000000	0.0000000000000000000000000000000000000
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LISTING 7-2 LONG FORM OF ECHO PRINTS - CONT'D

(PAGE 16 OF 17)

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00000	1.0000	.8750	.7500	.6250	.5000	.3750	.2500		000000
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LISTING 7-2 LONG FORM OF ECHO PRINTS - CONT'D

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CHAPTER 8

8. PROGRAM DESIGN

8.1 Programming Principles of COPE.

The main COPE program has been designed according to the following principles:

- (1) Input is designed to allow multiple cases per run with only a few mnemonically keyed input lines per case. For flexibility, it is also possible to read in data as traditional FORTRAN formatted input.
- (2) Output is designed so that the printout of results is nearly self-explanatory. In addition, user generated comments can easily be made to appear in the printout for any case.
- (3) The program is highly modularized. The main program consists almost entirely of calls to various subroutines together with the logic necessary to initialize and control the execution of three nested loops (see section 8.2).
- (4) Most subroutines or functions are designed for a single purpose (e.g., perform a test, read input, write output, etc.) so that when one wishes to change any aspect of the program it is usually necessary to change only a small number of the subroutines (usually the one performing a particular test plus the input routine).
- (5) The principles of structured programming have been adhered to in some degree. Because the program is written in FORTRAN IV (extended CDC version) which does not have if-then-else, do-until, do-while constructs, it is still necessary to use GO TO's and statement labels. However, blank comment cards have been inserted between logical blocks within each program to improve readability, and unnecessary GO TO's have been minimized. In addition, statement labels are in ascending numerical order within each subroutine.
- (6) All data statements have been grouped into a single BLOCK DATA subprogram.
- (7) Mnemonically meaningful variable and subroutine names have been selected.
- (8) FORTRAN code has been written to minimize the number of nonstandard (i.e., CDC peculiar) features used. Nevertheless, there are some CDC peculiar code features that were impractical to omit (e.g., READMS, SYSTEMC, etc.). These are cited in Chapter 13.

8.2 General Logic Flow.

The COPE main program can be viewed as three large nested loops on case, replication, and round. Figure 8-1 illustrates the general COPE logic flow including the three loops.

This figure is necessarily oversimplified and a more detailed flow chart is to be found in Chapter 11, but the overall picture is accurately summed up here.

8.3 Subroutine and Function Calling.

Table 8-2 gives a listing of the names of the main program, all of the subroutines, and all of the functions in the COPE program.

COPE is the main program name.

FPRCNT, GAMMA, IDCHAR, NUMRIC, and URAN31 are the function names.

ABRTTL, ADDTBR, ADDTOF, ARTCHK, BLOCHK, CCPLOT, COMMNT, CREAD, DETCTN, DFAULT, DFCHK, DUST, ECHO, FINDIT, GETRNG, GETTIM, GETVIS, HEADER, HITCHK, INITLZ, INPUT, LOSCHK, MINTRN, NOREC, OUTPUT, PECHK, PENAME, PKCHK, PPLOT, PSMOKE, REINTZ, RNDREL, RNGCHK, SEPREC, SMOKE, SMPLCD, TIMCHK, TITLE, USET, VISCHK, and WARNFO are the subroutine names.

PEIDNT is an entry point name in subroutine PENAME.

For each list entry (subprogram name) in Table 8-2, there are sections giving the names of subprograms calling the given list entry, the names of subprograms (in COPE) that the given list entry calls, and the names of system or IMSL routines that the given list entry calls.

There is a discrepany that occurs in the list. Subroutine NOREC is called by system routines LOCF (as an external argument) and SYSTEMC (by address loaded in IRAY array) and hence does not show as "CALLED BY" any routine in Figure 8-2 (see section 9.31).

Table 8-3 lists the system (CDC, standard FORTRAN, and International Mathematical and Statistical Library) routines used in COPE and the subprograms of COPE that call each of them.

Table 8-4 is a subprogram calling tree. Each subprogram (subroutine or function) in column two can be called by the COPE main program directly. Each subprogram in column N calls those subprograms in column N+1 to which it is linked by lines (V's, I's, -'s, and >'s).

NOREC calls no other subprograms in COPE. It is called by SYSTEMC whenever CDC FORTRAN IV Extended execution error 104 is encountered in INPUT, INITLZ, or FINDIT.

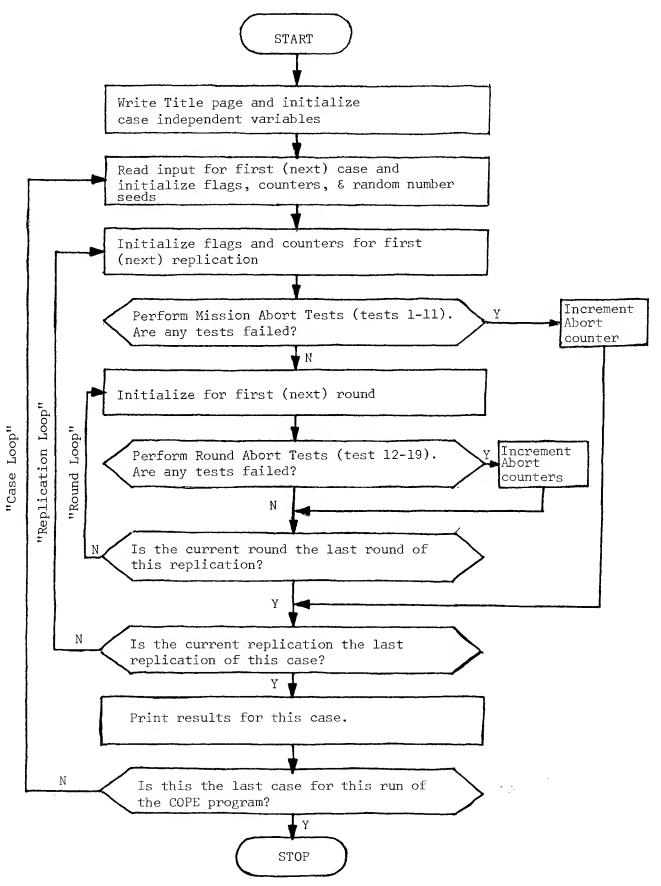


FIGURE 8-1 General COPE Logic Flow

TABLE 8-2 PROGRAM UNIT REFERENCES (SUBROUTINES, FUNCTIONS, AND MAIN PROGRAM)

ABRTTL,	CALLED BY	ARTCHK HITCHK RNGCHK	BLOCHK LOSCHK SMOKE	DETOTN MINTRW TIMOHK	DFCHK PECHK VISCHK	DUST PKCHK WARNDO	GETTIM RNDREL
ADDTER	CALLED BY	COPE					
ADDTOF	CALLED BY	COPE					
ARTOHK	CALLED BY CALLS	COPE ABRITL	URAN31				
BLOCHK	CALLED BY CALLS	COPE ABRITE					
CCPLOT	CALLED BY CALLS CALLS (SYS)	INPUT COMMNT ENCODE					
COMMNT	CALLED BY CALLS (SYS)	CCPLOT ENCODE	HEADER WRITE	IMPUT	PPLOT	SEPREC	
COPE	CALLS	ADDTER DUST INPUT REINTZ VISCHK	ADDTOF GETRNG LOSCHK RMDREL WARNDO	ARTCHK GETTIM MINTRN RNGCHK	BLOCHK GETVIS OUTPUT SMOKE	DETOIN HITCHK PECHK TIMCHK	DFCHK INITUZ PKCHK TITLE
CREAD	CALLED BY CALLS CALLS (SYS)	INPUT SEPREC DECODE	ENCODE	READ			
DETCTN	CALLED BY CALLS	COPE ABRITL	SMPLOD				
DEAULT	CALLED BY	INITLZ					
DECHK	CALLED BY CALLS CALLS (SYS)	COPE ABRITL AMAX1	URAN31				
DUST	CALLED BY CALLS	COPE ABRITL	URAN31				
ECHO	CALLED BY CALLS (SYS)	INPUT WRITE					
FINDIT	CALLED BY CALLS CALLS (SYS)	INPUT NUMRIC IFIX	LOCF	READMS	SYSTEMO	WRITE	
FPRONT	CALLED BY Calls (SYS)	OUTPUT ENCODE					
GАММА	CALLED BY CALLS (IMSL)	GETTIM GGAMA					

TABLE 8-2 PROGRAM UNIT REFERENCES (SUBROUTINES, FUNCTIONS, AND MAIN PROGRAM) - CONT'D

GETRNG	CALLED BY CALLS CALLS (SYS)	COPE SMPLCD FLOAT	STRACE				
GETTIM	CALLED BY CALLS	COPE ABRTTL	GAMMA	SMPLCD	URAN31		
GETVIS	CALLED BY CALLS CALLS (SYS)	COPE URAN31 STRACE					
HEADER	CALLED BY CALLS CALLS (SYS)	INPUT COMMNT DECODE	PEIDNT ENCODE	WRITE			
нітснк	CALLED BY CALLS	COPE ABRITL	URAN31				
IDCHAR	CALLED BY	NUMRIC	SEPREC				
INITLZ	CALLED BY CALLS CALLS (SYS)	COPE DFAULT LOCF	USET OPENMS	READMS	SYSTEMC		
INPUT	CALLED BY CALLS	COPE CCPLOT PENAME	COMMNT PPLOT	CREAD PSMOKE	ECHO SEPREC	FINDIT USET	HEADER
	CALLS (SYS)	ABS READMS	DECODE READ		EDF	FLOAT	LOCF
roscHK	CALLED BY CALLS CALLS (SYS)	COPE ABRTTL AMAX1	URAN31				
MINTRN	CALLED BY CALLS CALLS (SYS)	COPE ABRTTL AMAX1	URAN31				
NOREC	CALLED BY CALLS (SYS)	STRACE	WRITE				
NUMRIC	CALLEB BY CALLS CALLS (SYS)	FINDIT IDCHAR DECODE	ENCODE	WRITE			
OUTPUT	CALLED BY CALLS CALLS (SYS)	COPE FPRCNT FLOAT	WRITE				
PECHK	CALLED BY CALLS CALLS (SYS)	COPE ABRITL AMAX1	URAN31 FLOAT	MAXØ	MINØ	MIN1	
PEIDNT	CALLED BY CALLS (SYS)	HEADER ABS	DECODE	FLOAT	мов		
PENAME	CALLED BY CALLS (SYS)	INPUT ABS	ENCODE				

TABLE 8-2 PROGRAM UNIT REFERENCES (SUBROUTINES, FUNCTIONS, AND MAIN PROGRAM) - CONT'D

		•		•	•		•
PKCHK	CALLED BY CALLS CALLS (SYS)	COPE ABRTTL MINØ	URAN31				
PPLOT	CALLED BY CALLS CALLS (SYS)	INPUT COMMNT ENCODE					
PSMOKE	CALLED BY CALLS (SYS)	INPUT AMIN1	FLOAT				
REINTZ	CALLED BY CALLS (SYS)	COPE MOD	WRITE				
RNDREL	CALLED BY CALLS	COPE ABRTTL	URAN31				
RNGCHK	CALLED BY	COPE ABRTTL					
SEPREC	CALLED BY CALLS CALLS (SYS)	CREAD COMMNT ENCODE	INPUT IDCHAR				
SMOKE	CALLED BY CALLS	COPE ABRITL	URAN31				
SMPLCD	CALLED BY CALLS CALLS (SYS)	DETCTN URAN31 STRACE	GETRNG WRITE	GETTIM			
TIMCHK	CALLED BY CALLS	COPE ABRTTL					
TITLE	CALLED BY CALLS (SYS)	COPE DATE	TIME	WRITE			
URAN31	CALLED BY	ARTCHK LOSCHK SMPLCD	DFCHK MINTRN WARNDO	BUST PECHK	PKCHK GETTIM	GETVIS RNDREL	SMOKE HITCHK
USET	CALLED BY	INITLZ	INPUT				
VISCHK	CALLED BY CALLS	COPE ABRTTL					
OGNRAW	CALLED BY CALLS	COPE ABRITL	UPAN31				
-							

TABLE 8-3 SYSTEM AND IMSL ROUTINE REFERENCES

ABS	CALLED BY	INPUT	PEIDNT	PENAME			
AMAXI	CALLED BY	DECHK	LOSCHK	MINTRN	PECHK		
AMIN1	CALLED BY	PSMOKE					
DATE	CALLED BY	TITLE					
DECODE	CALLED BY	CREAD	HEADER	INPUT	NUMRIC	PEIDNT	
ENCODE	CALLED BY	CCPLOT NUMRIC	COMMNT PENAME	CREAD PPLOT	FPRONT SEPREC	HEADER	IMPUT
EOF	CALLED BY	INPUT					
FLOAT	CALLED BY	GETRNG	INPUT	DUTPUT	PECHK	PEIDNT	PSMOKE
GGAMA	CALLED BY	GAMMA					
IFIX	CALLED BY	FINDIT					
LOCF	CALLED BY	FINDIT	INITLZ	INPUT			
MAX®	CALLED BY	PECHK					
MING	CALLED BY	PECHK	PKCHK				
MINI	CALLED BY	PECHK					
dow	CALLED BY	PEIDNT	REINTZ				
OPENMS	CALLED BY	INITLE					
READMS	CALLED BY	FINDIT	INITUZ	INPUT			
READ	CALLED BY	CREAD	INPUT				
STRACE	CALLED BY	GETRNG	GETVIS	NOREC	SMPLCD		
SYSTEMO	CALLED BY	FINDIT	INITLZ	IMPUT			
TIME	CALLED BY	TITLE					
WRITE	CALLED BY	COMMNT NUMRIC	ECHO OUTPUT	FINDIT REINTZ	HEADER SMPLCD	IMPUT	NOREC

NOTE: ALL ROUTINES LISTED IN THE FIRST COLUMN OF THIS TABLE (EXCEPT GGAMA) ARE STANDARD SYSTEM ROUTINES OF CDC FORTRAN EXTENDED VERSION 4.
GGAMA IS A SUBROUTINE FROM THE INTERNATIONAL MATHEMATICAL AND STATISTICAL LIBRARY (IMSL).

TABLE 8-4 COPE SUBROUTINE "TREE"

```
COPE----->ADDTBR
   I -----> ADDTOF
     ----->ARTCHK---<mark>-->ABRTT</mark>L
                 I---->URAN31
   1----->BLOCHK---->ABRTTL
   I---->DETCTN----->ABRTTL
                 I---->SMFLCD---->URAN31
     ---->DFCHK----->ABRTTL
                 I---->URAN31
      ----->DUST---->AERTTL
                I---->URAN31
   I---->GETRNG---->SMPLCD---->>URAN31
      ----->GETTIM---->ABRTTL
                 I---->GAMMA
                  I---->SMPLCD----->URAN31
                  I---->URAN31
     ----->GETVIS----->URAN31
      ----->HITCHK----->ABRTTL
                  I---->URAN31
      ----->INITLZ----->DFAULT
                  I---->USET
     ----->INPUT----->CCPLOT----->COMMNT
                 T---->COMMNT
                 I----->CREAD----->SEPREC----->COMMNT
   ٧
                                          I---->IDCHAR
   ٧
    ٧
                  ---->ECHO
    Ų
                  ---->FINDIT----->NUMRIC---->IDCHAR
                   ---->HEADER---->COMMNT
    V
                              I---->PEIDNT
    ٧
                   ---->PENAME
    ٧
                  ---->PPLOT---->COMMNT
    V
    V
                  ---->PSMOKE
                  ----->SEPREC---->COMMNT
                              I---->IDCHAR
                 I---->USET
      ----->LOSCHK----->ABRTTL
                  I----->URAN31
     ----->MINTRN----->ABRTTL
                  I---->URAN31
      ---->BUTPUT---->FPRCNT
       ---->PECHK---->ABRTTL
                 I---->URAN31
     ---->PKCHK----->ABRTTL
                 I---->URAN31
    I----->REINTZ
    I----->RNDREL---->ABRTTL
                  I---->URAN31
    I---->RNGCHK---->ABRTTL
       ---->SMOKE---->ABRTTL
                 I---->URAN31
       ---->TIMCHK---->ABRTTL
      ---->TITLE
     ----->VISCHK----->ABRTTL
      ----->WARNDO---->ABRTTL
                  I---->URAN31
NOREC
```

CHAPTER 9

SUBPROGRAMS

This chapter explains in moderate detail what each subprogram of COPE does. All four standard FORTRAN subprogram types (main program, block data, function, and subroutine) are present in COPE. In the following, the subprograms are discussed in this order: main program, block data, functions (in alphabetical order), and subroutines (in alphabetical order).

This chapter deals only with subprograms defined by COPE. System subroutines and functions are divided into three classes: standard FORTRAN IV routines, routines peculiar to CDC FORTRAN 4 Extended, and IMSL routines. The reader is assumed to be familiar with the first of these classes (or at least have access to a FORTRAN manual). System routines in the remaining two classes are discussed to some extent in Chapter 13.

9.1 COPE Main Program.

The COPE main program is well summarized by the flowchart in Figure 8-1.

The main program begins by calling routines that write the title page (TITLE) and initialize case independent variables (INITLZ).

Next the main program calls INPUT to read the first (or next) case's input. It then calls REINTZ which re-initializes certain case dependent counters and random number seeds. It then initializes the current replication number at one and the number of FO's (DO's) killed so far in the case at zero. The steps in this paragraph begin the "case loop."

The main program next begins the "replication loop" for the first (or next) replication of the current case. This loop begins by initializing the number of the current round to one and then setting various times, flags, and a counter.

The "replication loop" now continues by calling a sequence of subroutines which perform the tests described in Chapter 2 and sample weather, range-LOS, and time data.

routines (in order called)	purpose
ARTCHK	perform test 1
GETVIS	sample weather distribution
GETRNG	sample acquisition range and
	LOS segment distributions
VISCHK	perform test 2
RNGCHK	perform test 3
DETCTN	perform test 4
SMOKE	perform test 5
DUST	perform test 6
BLOCHK	perform test 7
GETTIM	sample time distribution(s)
	and perform tests 8 and 9
BLOCHK	perform test 10
TIMCHK	perform test 11 (for "shoot-
	ting gallery" only)
ADDTOF	calculate round arrival time

Each of these routines is explained in detail later in this chapter.

Note that if any routine that performs one (or more) of the tests is called and the test is failed, then the subsequent routines in the above list are not called; instead, control transfers to statement 140 (end of "replication loop") where a check is made to determine whether all of the replications for this case have been done. If they have, OUTPUT is called to print case results and then the end of the "case loop" is either hit and control returns to statement 100 which calls INPUT to read the input for the next case or, if the last case has been run, control passes to the STOP and the program terminates. If not all replications for the current case have been completed, then the number of the current replication is increased by one and control returns to statement 110 (which is the start of the "replication loop") to begin next replication.

If none of the tests are failed and the program reaches ADDTOF on the current replication, then the "round loop" begins (with statement 120). The "round loop" consists of a further sequence of subroutines which are called to perform those tests that may affect only one round.

<u>routines</u> (in	order called)	purpose
LOSCHK WARNFO DFCHK RNDREL MINTRN PECHK		perform test 12 perform test 13 perform test 14 perform test 15 perform test 16 perform test 17
HITCHK PKCHK		perform test 18 perform test 19

Again, each of these routines is explained in detail later in this chapter.

If any subroutine that performs one of these tests (12 through 19) is called and the test is failed, then the subsequent routines in the above list are not called for the current round; instead, control transfers to statement 130 (end of "round loop") where a check is made to determine whether all of the rounds for this replication have been done. If they have, control transfers to statement 140 (end of "replication loop") where the check is made to determine whether more replications are to be done for the current case. If not all rounds for this replication have been completed, then the time the next round arrives is computed (ADDTBR), the round number is incremented by one, the end replication (or ENDREP) flag is reset and control transfers to statement 120 (start of "round loop") to begin the next round.

If no test is failed, then control reaches statement 130 after the entire sequence of subroutines in the "round loop" has been called. At this point a check is made to determine whether all rounds for this replication have been done. Control then proceeds just as in the case when statement 130 is reached due to a failed test as described in the paragraph above.

When all the rounds for a replication are completed, a check is made to determine whether more replications remain to be done (end of "replication loop"). If more replications remain, control transfers to 110 (start of "replication loop") to begin the next replication. If all replications for the current case are completed, then OUTPUT is called to print results for current case (end of "case loop").

When a case ends and its results are printed, the program checks whether the last case flag (ENDFLG) has been set. If it has, the program stops; if it has not been set, then control goes to statement 100 and INPUT is called to read the next cases input. If there is input for another case, it is read and the entire process from INPUT through end of "case loop" is repeated; if there is no input for further cases, the program terminates.

9.2 BDATA1 Block Data Subprogram.

BDATAl consists entirely of data statements used to initialize variables in various COMMON blocks. These blocks are listed in section 4.7 and are their variables defined individually in Chapter 12 (Glossary of Variables).

9.3 FPRCNT Function.

This function formats percentages. It takes a numerical argument XIN and a logical argument PAREN and assigns a one word alphanumeric character string as the value of FPRCNT.

If XIN is negative, then FPRCNT is assigned: the left justified character string $\underline{\text{UNDEF}}$, when PAREN is true; the right justified character string $\underline{\text{UNDEF}}$, when PAREN is false.

If XIN \geq 100.05, a STOP occurs with an error message (see section 7.5.7).

 $\,$ If XIN is positive and less than 100.05, then FPRCNT is assigned:

a left justified character string of the form X.XXX), XX.XX%), or 100.0%), when PAREN is true;

a right justified character string of the form X.XX%, XX.XX%, or 100.0%, when PAREN is false.

The character strings created by FPRCNT are used by OUTPUT to print percentages. FPRCNT is called only from OUTPUT.

9.4 GAMMA Function.

This function takes two arguments, one real parameter ALPHA and one integer IRN, and returns a real value as GAMMA.

ALPHA is the α -parameter of the gamma distribution's probability density function:

$$g(x) = \frac{1}{\Gamma(\alpha)} x^{\alpha-1} e^{-x}$$

GAMMA is assigned a value obtained by randomly sampling from the above distribution. This sampling is accomplished by calling the IMSL subroutine GGAMA with random number seed IRN.

The function GAMMA itself then really does nothing more than dimension two arrays required by GGAMA, define an additional variable used by GGAMA, call GGAMA with ALPHA, IRN, the two arrays and the additional variable as arguments, and then set GAMMA equal to the random sample obtained by GGAMA from the gamma distribution.

9.5 IDCHAR Function.

The IDCHAR function takes three arguments, one real array A and two integer variables N and I. It returns an integer value.

The array A of dimension N should be filled with left justified characters, one character per word. (Most often A is dimensioned with N=80 and consists of a card image read under 80Al Format in INPUT). The function IDCHAR then examines the Ith element of the array, that is A(I).

The function IDCHAR is then assigned a value as follows:

IDCHAR = 0 if A(I) is a number or minus sign (hyphen);
IDCHAR = 1 if A(I) is a letter or an apostrophe;
IDCHAR = 2 if A(I) is a decimal point (period);
IDCHAR = 3 if A(I) is a blank;
IDCHAR = 4 if A(I) is a separator (i.e., a comma, a left or right parenthesis, a slash, or a question mark);
IDCHAR = 5 if A(I) is a dollar sign; and
IDCHAR = 6 if A(I) is anything else.

9.6 NUMRIC Function (Logical Valued).

The NUMRIC function takes one real array argument, B, and three integer variable arguments N1, N2, and IB.

The array B of dimension N1 by N2 (i.e., DIMENSION B(N1, N2)) is checked to determine whether its IBth line (that is, entries B(J, IB) for $J=1, 2, 3, \ldots, N2$) is numeric data (i.e., whether it consists only of numerals, minus sign, and decimal point possibly with trailing blanks).

If the line is numeric data, NUMRIC is assigned the value TRUE. If the line contains some non-numeric characters (letters, commas, etc.), then NUMRIC is assigned the value FALSE.

The IBth line of the B array is treated as a left justified character string (10 characters per word) which is examined character by character. Only the first 80 characters of the line are examined.

When the line being checked meets certain special conditions, other actions may be taken: If more than one decimal point is encountered, an error stop with message occurs. If no decimal point is encountered but the characters are otherwise numeric data, then a decimal point is added to B at the end of the non-blank characters, NUMRIC is assigned the value TRUE, and a return occurs. If the data are numeric but consist of more than ten non-blank characters (including the added decimal point, if any), then an error stop with message occurs. If the data contain imbedded blanks, then checking stops at the first imbedded (i.e., non-trailing) blank and the program behaves as though every character following were a blank. (This should have no effect in practice since the only imbedded blanks occur in PEDATA record names entered with the \$ preceding them. Those names will already have failed the numeric test before ever reaching their first imbedded blanks).

9.7 URAN31 Function.

This function takes one integer argument I and returns a real value between 0 and 1 (exclusive).

This is the "random" number generator used to sample most COPE data and to generate "random" numbers to be compared against probabilities to determine whether various tests are passed.

The best results are obtained when I is an odd integer in the range from 0 to 67108864. URAN31 generates a sequence of "random" numbers by replacing I by 3125*I(MOD~67108864) and then setting URAN31 equal to I divided by 67108864. (That is, a linear congruential type random number generator A(N+1) = A(N)*B(MOD~C) where B = 3125 and C = 2**26). Then repeating the process with the new value of I gives the next "random" number.

The function is written so that overflow will not occur even on machines with a word size as small as 32 bits.

Normally, one would not define the random number generator explicitly in the program code since one is available on nearly every computer as a standard system function. However, because users on other machines may wish to run the sample cases (see appendices) to check for correct implementation, the URAN31 function has been built into COPE as its standard (system independent) random number generator.

9.8 ABRTTL Subroutine.

This subroutine takes the integer argument IABRT which is the number of the test whose failure caused ABRTTL to be called.

ABRTTL updates the test abort total array NABORT by increasing the proper entry of the NABORT array by one. For mission aborts, the elements corresponding to all rounds of the IABRTth test are increased; for round aborts, only the element corresponding to the IABRTth test and current (KRFth) round is increased.

In addition, the flag ENDREP is set to TRUE to indicate that a test has been failed and the current replication (or round) need not continue through the subsequent tests.

9.9 ADDTBR Subroutine.

This subroutine adds TBR (time between rounds) to TIMRA (time round arrived) to obtain the new value for TIMRA (time next round arrives).

9.10 ADDTOF Subroutine.

This subroutine adds TOF (time of flight) to TIMNOW (time gun is ready to fire Copperhead) to obtain the TIMRA (time first round arrives).

9.11 ARTCHK Subroutine.

This subroutine performs the test to determine whether the FO (or DO, designator operator) has been killed or suppressed by RED preparatory artillery fires on this replication.

9.12 BLOCHK Subroutine.

This subroutine performs the bail out checks (tests 7 and 10).

9.13 CCPLOT Subroutine.

This subroutine would produce a Cal-Comp plot of case results, if implemented. At the present time it merely produces a comment that no plot was produced for the case.

9.14 COMMNT Subroutine.

This subroutine takes four arguments: one real array A containing the character string that is the comment, one integer N1 which is the dimension of A, and two logical flags that indicate whether the comment is a user comment and whether the comment is a program generated "\$\$\$" comment.

The subroutine writes the comment immediately (along with a "\$\$\$" comment page heading, if needed) if the comment is a "\$\$\$" comment (either user or program generated). If the comment is a "\$\$" comment, then it is encoded into the CMENT array for later printing with the current case. If the comment is a "\$" comment, it is ignored and a return occurs.

Note that user comments are in format 80Al with DIMENSION A (80) whereas program generated comments are in format 8AlO with DIMENSION A(10). This difference need not concern the casual user, but is required knowledge if one is to modify the program in so far as comments are concerned.

9.15 CREAD Subroutine.

This subroutine is called by INPUT whenever the user exercises the temporary option. The second field on the $\overline{\text{TEMPORARY}}$ card will be used by subroutine INPUT to set the value of IT2 equal to the keyword number for which the temporary option is being used.

CREAD then sets ITYPE equal to IT2-20 and executes a computed GO TO on ITYPE. As a result of this computed GO TO, control transfers to one of eight sections where the formatted temporary data is read. Each of these sections corresponds to one of the eight data blocks and each consists mainly of READ statements that fill in that data block's variables. When the reading is completed, control branches to statement number 410 where a return occurs.

9.16 DETCTN Subroutine.

This subroutine samples the detection time distribution to obtain the detection delay time for this replication (i.e., time from unmask until D.O. initiates call for fire. It includes detection, acquisition, and decision time).

If "random occurrence" is being played, control returns. If "shooting gallery" is being played, the detection delay time is compared with the line of sight duration (test 4). If the test is passed, a return occurs; if the test is failed the abort totaller is called (ABRTTL) prior to the return.

9.17 DFAULT Subroutine.

This routine merely sets the default values for many of the case descriptor parameters, data block record names, and flags. (It could really be replaced by some data statements to fill in these same variables if one so desires).

9.18 DFCHK Subroutine.

This subroutine performs test 14. If the FO (DO) has been killed on a previous call for the current replication, control transfers to 120 where the round abort is totalled (call to ABRTTL) followed by a return.

Otherwise, the routine calculates the current designator-to-target range. Then it uses that range value to interpolate in the DFFOKL array to obtain probability that direct fire kills the DO and probability that direct fire obscures but does not kill the DO. When these probabilities are obtained, test 14 is performed to determine whether the DO is unaffected, obscured but not killed, or killed. If the DO is unaffected, the routine returns; if the DO is obscured but not killed, the routine calls ABRTTL to increment the round abort counter and then returns; and, if the DO is killed, the routine increments the DO killed counter, sets the DO killed flag, then calls ABRTTL and returns.

9.19 DUST Subroutine.

This subroutine performs test 6 and calls ABRTTL if the test is failed.

9.20 ECHO Subroutine.

This subroutine takes the integer argument IUNIT. IUNIT is the logical I/o unit to which ECHO will write. (IUNIT = 8 currently)

Subroutine ECHO does nothing more than write out the current values of the parameters, flags, arrays, etc. that describe the conditions of the case. (see section 7.6) This printout is provided primarily as a debugging aid.

9.21 FINDIT Subroutine.

This subroutine takes a real array B of character strings dimensioned N1 by N2 and returns an integer valued array IT dimensioned N3. Normally N1 = 8, N2 = 10, and N3 = 10 so we have

DIMENSION B(8, 10), IT (10). The Kth line of B (i.e., B(J,K) for J = 1,2,3,...,8 with K fixed) consists of the character string found in the Kth field of the input card just read. This character string is compressed by eliminating blanks (the exception is that blanks occurring in PEDATA record names preceded by \$ are preserved when moved into the B array) and packing the results 10 characters per word into B.

Subroutine FINDIT compares the first line of the B array (B(1,1) through B(8,1)) with the keywords in the CHAR array in an attempt to find a match. If not successful, an error message and error stop occur; if a match is found, then IT(1) is set to the keyword number (contained in CHAR array also).

Next, if the match occurred with the TEMPORARY, OVERRIDE, or RESET keywords, then a second pass through the keyword list (CHAR array) is made to find a match with the second line of the B array. If this search is successful, IT(2) is set to the value of the matched keyword and a return occurs. If unsuccessful, an error message and stop occurs. An error message and stop also occur if a match is found for a keyword that is not allowed with TEMPORARY, OVERRIDE, or RESET.

If the first match was not with TEMPORARY, OVERRIDE, or RESET, then the routines checks CHAR (2, IMATCH) to see how many option word character strings are allowed with the IT(1)th keyword. If this number is zero, that is the flag to the program that it may have one of the keywords that takes only numerical values and so control transfers to statement 210. At statement 210, B(1,2) is checked. If B(1,2) is blank, a return occurs; if B(1,2) is numeric data, IT(2) is set to zero; if B(1,2) is neither blank nor numeric an error print occurs. Note that the blank occurs either when the keyword has no optionwords allowed (as with FIRST CASE, END, etc.) or when the keyword is omitted (i.e., the default valued is desired).

If CHAR(2, IMATCH) is non-zero, it gives the number of different option word character strings allowed with the current card's keyword. The TAPE 11 record name is then set to the abbreviated form of the keyword and the record of option word character strings allowed with the keyword is read into the CHARA array. The program then proceeds to match B(2,1) through B(2,8) with allowable option word choices for option word 1, B(3,1) through B(3,8) with allowable choices for option word 2, etc. If a match is not found for any line of B, then it is tested to see whether it is numeric; if not, an error message and stop occur, if it is numeric, the next line of B is checked. If line K of B is numeric, IT(K) is set to zero; if line K of B is blank, IT(K) is left at one (the value indicating default) to which it was set near the beginning of FINDIT; if line K of B matches one of the character strings allowed for option word K-1, then IT(K) is set equal to the number of the option word choice.

It is through setting the IT array that FINDIT signals sub-routine INPUT as to which keyword and optionwords were found on the input card. Of course, in the case of numeric data or OVERRIDE record names, the values in the B array will have further use even after IT has been determined.

9.22 GETRNG Subroutine.

This subroutine samples the cumulative distribution of acquisition ranges (actually designator-to-target ranges at time of unmask) to obtain the initial designator-to-target range for the current replication. The cumulative distribution of line-of-sight segment lengths corresponding to the range bracket in which the designator-to-target range lies is then sampled to obtain the length of the segment of the target's path that is visible to the DO. This LOS segment length is then added to the target column's length and the sum is divided by the target velocity to obtain the duration of line of sight (i.e., the length of the time interval from target unmask until LOS to last vehicle in column is lost). Next a return is executed.

If the target velocity is zero (or negative) an error stop with message occurs.

9.23 GETTIM Subroutine.

This subroutine serves three basic functions: (1) perform test 8, (2) perform test 9, and (3) calculate the response time (time from DO call for fire until gun is ready to fire Copperhead) for those missions that pass tests 8 and 9.

As mentioned in Chapter 2, there are three different ways of playing communication and processing delay times.

- (1) If parameterized response time (PRSPTM) is non-zero, then this routine sets the time the gun is ready to fire (TIMNOW) equal to PRSPTM. It then performs test 8 and 9. If either test fails, ABRTTL is called and a return occurs; otherwise, ABRTTL is not called and the routine executes a return with TIMNOW = PRSPTM.
- (2) If parameterized response time is zero, then the routine is to sample to obtain response time. If the variable FTSILL is TRUE, the routine samples the single response time distribution (FSRT array) to obtain the response time which is then added to the detection time to obtain the time at which the gun is ready to fire. It then performs tests 8 and 9. If either test fails, ABRTTL is called and a return occurs; otherwise, ABRTTL is not called and the routine executes a return with TIMNOW set at the value to be used for this replication.

(3) Finally, if parameterized response time is zero and the variable FTSILL is FALSE, then the routine uses the sum of the separate response time components as the response time. If digital communication is modeled, then the time to enter digital data into DMD is sampled and added to current time (TIMNOW which was previously set to DETTIM).

Then an unnumbered test is made to determine whether digital commo is successful. If it is, a transmission time is added to TIMNOW and control transfers to statement 160 (see below). If digital commo fails, then a test is performed to determine whether voice commo is successful. If voice is successful, then a time to switch from digital to voice and the voice commo transmission time are added to TIMNOW before control transfers to statement 160. If voice is also unsuccessful, then test 8 is considered to have been failed, ABRTTL is called, and a return executed.

If digital commo is not selected, then voice commo only is played. In this case, the test for successful voice commo is made (test 8) and if failed, an abort (call to ABRTTL) occurs followed by a return. If the test is passed, a voice commo time is added to TIMNOW and control reaches statement 160.

At statement 160, the battery computer system processing and battery response time are added to TIMNOW. Test 9 is then performed. If it fails, ABRTTL is called and a return executed; if it is passed, then TIMNOW is returned to be used for the current replication.

9.24 GETVIS Subroutine.

This subroutine samples the weather data used in the current case to obtain the cloud ceiling altitude and the visibility range limit.

The routine first randomly determines whether there is a cloud ceiling. Next it randomly determines whether there is a cloud free line-of-sight for the COPPERHEAD trajectory.

If there is a cloud-free line-of-sight, then the cloud ceiling altitude is set to its highest value and a visibility limit is determined by random sampling using the PRGCFL array. Control then branches to statement 160 (see below).

If there is no cloud-free line-of-sight, then the cloud ceiling altitude and visibility limit are both determined by a random sampling from the W array.

Note that the items of importance that are defined by this routine are the subscript of the cloud ceiling altitude (ICC), the subscript of the visibility range limit (IVL), and the visibility range limit itself (VISLIM). Also, note that ICC is initially a function of increasing altitude (that is, higher altitudes correspond to larger values of ICC); however, because the ordering convention for cloud ceilings was reversed between the weather data and the PE data, ICC is redefined after statement

160 by setting the new value of ICC equal to seven minus the old ICC value (so that higher altitudes correspond to lower values of ICC).

9.25 HEADER Subroutine.

This subroutine produces the heading page for each case.

The heading page is produced by encoding the lines for the first column of boxes into the AOUT array; those for the second column into the BOUT array; and those for the third column into the COUT array.

Next the routine generates some comments regarding time inconsistencies, record name overrides, and data read by the TEMPORARY option as applicable.

Finally, following the lines giving case number and number of replications (which are written before HEADER does any encoding) HEADER writes the AOUT, BOUT, and COUT arrays to produce the nine boxes of case description information that occur on the case header page. Then if any "\$\$" comments are to be printed for this case, the CMENT array is written (this includes both user comments and program generated comments).

9.26 HITCHK Subroutine.

This subroutine performs test 18.

First, it interpolates with respect to designator-to-target range (RNGNOW) in the proper row of the TTF array as determined by designator type and target posture (exposure) to obtain the probability of hit. This probability of hit is really the probability of hit given that the round engages (that is, that the seeker locks onto the laser spot on the target and does so within the maneuver footprint of the COPPERHEAD round).

Next the routine compares a random number (between 0 and 1) to the probability of hit to determine whether the current round hits. If the round hits, a return occurs; if not, ABRTTL is called to record the failure (miss) and a return occurs.

9.27 INITLZ Subroutine.

The subroutine initializes certain case independent values.

After setting IRAY and calling SYSTEMC to set the non-standard error recovery process, the routine proceeds to set the values of CHAR (2,I) for $I=1,2,\ldots$ NREC from the values in the record named OPTNNUMS on Tape 11. (This record is automatically updated by the PREPMS program each time new optionword character strings are added for a keyword).

The program next calls DFAULT to set the default values for the various case descriptors, record names, etc. Then USET is called to set the values to be used as the base to which the first case input card values are to be applied. Finally, MSABLM is set and a return is executed.

9.28 INPUT Subroutine.

This subroutine reads the input lines for a given case and sets the variables in the program to the values required to run the case.

This routine is the longest and one of the most complex in the COPE model. It is most easily followed by means of a flowchart (see Chapter 11); however, an attempt to sketch its main sections is given here.

- (1) First, the routine checks to determine whether there is another case to read. If not, it stops. If there is more to read, the routine first sets IRAY and calls SYSTEMC to establish non-standard error recovery. Then it clears various arrays and counters and increments the case number.
- (2) Next it reads input cards until it encounters an END, ENDF, or end-of-file. For each card that it reads, it first checks whether that card is a comment card; if it is, subroutine COMMNT is called and the next card is read. If the card is not a comment, the routine calls SEPREC which separates the fields on the input card and moves each of them into a line of the B array. Then subroutine FINDIT is called to match each line in the B array against the keywords and option words allowed in that field. This matching determines the values of the IT array.

The program next checks to see whether the current card supersedes some of the previous cards for the current case. If it does, a comment is generated; in either case, the routine next branches to one of five statements depending on whether the card is a FIRST CASE, NEXT CASE, END, ENDF, or any other card, respectively. If the card is an END or ENDF, control transfers to statement 490 (see below). If the card is a NEXT CASE, RD (or equivalent), USET is called to establish the default values as the base to which changes caused by the input cards are to be applied; if the card is NEXT CASE, DR, then USET is not called and the changes caused by the input cards are applied to the conditions in effect for the previous case. Either type of NEXT CASE (or FIRST CASE) causes control to then read the next card. If the card is not an END, ENDF, NEXTCASE, or FIRST CASE, then control reaches statement 200.

At statement 200, a many branched computed GO TO is executed; the branch followed depends on the keyword number (IT1 or IT(1)). The actions taken for each case of the computed GO TO are varied but the main activities are to fill the UVALUE array with either numerical values, record names, or flag values. If the keyword was TEMPORARY, CREAD is called; if OVERRIDE, the record name is set; and if RESET, the default for that keyword is reactivated. Each case of the computed GO TO ends with a GO TO returning control to the line that reads the next input card.

- (3) At line 490 the routine starts filling in the values of the various parameters that describe the current case (flags, arrays, single variables, etc.). These are generally filled in by calls to READMS to read records to fill in data blocks (record names as established when filling in UVALUE array), by equating variables to UVALUE numerical values, by looking up values in pre-defined arrays according to a subscript value in UVALUE array, by calling a special subroutine (in the case of PEDATA) to generate a record name and then reading that record from TAPE 11 into the data block, or by calling special routines (such as PSMOKE) that use inputs to calculate a parameter value. In any event, by the end of INPUT all variables required to run the case have been set and the replications can begin.
 - (4) INPUT finishes by calling HEADER and ECHO and then returning.

9.29 LOSCHK Subroutine.

This subroutine is used to determine whether the DO still has (macro-terrain) LOS to the target when the round arrives (test 12).

It performs the test in two different ways depending on the LOS model used.

For "shooting gallery", it merely compares the time the round arrives with the duration of the line-of-sight. If the round arrives before the line-of-sight ends, a return is executed; if the LOS ends before the round arrives, ABRTTL is called prior to the return.

For the "random occurrence" LOS model, the probability P of LOS to a single vehicle in the current designator-to-target range bracket is found. The probability that at least one vehicle is in view is then taken to be equal to 1-(1-P)**XNV where XNV is the number of target vehicles currently unkilled. Once this probability is obtained, it is compared to a random number and the result settles test 12. If test 12 is passed, a return occurs; if it is false, ABRTTL is called, then a return occurs.

9.30 MINTRN Subroutine.

This subroutine performs test 16 and sets target posture (exposure) with respect to mini-terrain.

First the current designator-to-target range is computed. Then this range is used to interpolate in each of the three rows of the PSTTBL array. As a result of this interpolation the PSTVAL array is filled with the probabilities of completely obscured target posture, fully exposed target posture, and hull defilade (turret exposed) target posture respectively.

A random number is then drawn and compared to these probabilities to determine which of the three target postures occurs. If the target posture is "completely obscured", then test 16 is failed, ABRTTL is called, and a return occurs; otherwise, ITGTPS is set to indicate the target posture (1 for fully exposed; 2 for hull defilade) to be used in hit and kill probability tests and a return occurs.

9.31 NOREC Subroutine.

This routine is called indirectly through the CDC non-standard error recovery facility (SYSTEMC routine explained in <u>CDC Fortran</u> 4 Extended) It is called whenever READMS attempts to read a record from TAPE 11 using a record name that does not correspond to any of the records on TAPE 11.

The routine writes a message giving the record name that could not be found, executes a subroutine call trace and then executes a stop with message.

9.32 OUTPUT Subroutine.

This subroutine writes the results page for each case.

The routine begins by clearing several arrays.

Next, it calculates the percentage of total missions that have a failure (abort) at each test (for "round" aborts, this percentage is calculated for each round). This is the ABRPCT array.

Then it calculates what percentage of the missions that reached a given test passed it. Again this is calculated for each round for the "round" aborts. This is the PASPCT array.

Next the program sets the number of occasions, attempted engagements, and shots.

Then it compares the number of kills as calculated by two different counters and, if there is a disagreement in value between them, it prints a message (see Section 7.3.1).

Next, it calculates the probability of kill given an occasion, the probability of kill given an attempted engagement, and the probability of kill given a shot. These are calculated separately for each round of the mission.

Then it calculates the probability of a shot given an occasion, probability of a shot given an attempted engagement, and probability of attempted engagement given a shot. It also calculates the probability of having line-of-sight on each round.

Next it compares the number of missions (or rounds, as appropriate) tested for each abort condition as computed in two different ways. If the results differ an error message is generated (see section 7.3.2).

Then the program calculates the FO (DO) survivability measures; that is, probability DO is killed and probability DO is not killed given that the mission reached that test.

Now that all of the values to be printed on the results page have been calculated the routine proceeds to print the results in the order they appear on the case results page (see Chapter 6).

Note that prior to printing percentages, function FPRCNT is applied to format the percentages for output. Also note that any percentage valued variables with the value -1.0 are printed as "UNDEF" indicating undefined value (this occurs when the percentage could not be calculated due to a zero denominator. It is for this reason that all percentage valued variables in OUTPUT are initialized at -1.0 and then only assigned values if the ratio used in computing the percentage has non-zero denominator).

9.33 PECHK Subroutine.

This subroutine performs test 17 (i.e., does COPPERHEAD round engage the target?)

First it calculates the delay time (DELTAT) for the current round. By delay time is meant the time the round arrives minus the expected arrival time (which is based on nominal response time). Next the value of IMUTS (the "MUTS" factor -- see Section 16.1) is determined and the range value indices to be used for interpolation are set.

If IMUTS is 2, it means that not all vehicles in the target column have passed the point of closest approach to the centroid of the COPPERHEAD footprint. That is, delay has no effect and so PE is computed by interpolating with respect to designator-target range alone in the PETBL array (using delay time equal to zero (IDELTT=1) and holding cloud ceiling and visibility limit constant at their previously sampled values (obtained in GETVIS)).

If IMUTS is 1, it means that all vehicles in the target column have passed the point of closest approach to the centroid of the COPPERHEAD footprint. That is, delay time has an effect and so PE is computed by interpolating with respect to both designator-target range and delay time while holding cloud ceiling and visibility limit constant.

In either case, once PE (probability that seeker engages target and target is within Copperhead maneuver footprint) is computed, it is compared to a random number sampled from a uniform distribution (from 0 to 1). If the random number is less than PE, a return occurs; otherwise, ABRITL is called before the return occurs.

9.34 PENAME Subroutine and PEIDNT Entry.

This subroutine takes ten arguments. When the call is to PENAME the first nine are "input" and the last one is "result"; whereas a call to PEIDNT uses the current value of the tenth argument as "input" and returns the values for the other nine.

This subroutine is used to create PE data record names. The values of the nine parameters (see section 5.4) are taken as arguments (in the same order they are described in section 5.4). They are loaded into the AVALUE array and are searched for in the XVALUE array. When matches are found, the corresponding XVALUE entries (for XVALUE (I,J,2)) are used to construct the record name which is returned as IDCODE.

When PEIDNT is called, the record name is decomposed into the separate XVALUE (I,J,2) values (and TR value) used to create it. The corresponding XVALUE (I,J,1) values are found and equated to the nine parameters (note slightly different handling of TR, nominal response time). These values are then returned.

Note that while every choice of the nine parameters can give at most one record name, there may be more than one choice of parameters that can give that record name. For example, if all parameters are held constant except target velocity (VEL), then VEL = 2 m/s and VEL = 3 m/s will give the same record name (using the current XVALUE array). Hence, when that record name is decoded by PEIDNT to obtain the parameters to which it corresponds, it will have no way of choosing between 2 m/s and 3 m/s for VEL; instead it will merely take the first one that matches (2 m/s in this case).

9.35 PKCHK Subroutine.

This subroutine performs test 19 (i.e., did the COPPERHEAD kill the target?)

The routine looks up the PK (probability of kill given a hit) in an array as a function of target type and target posture (exposure). This value is then compared to a random number sampled from

a uniform distribution (from 0 to 1). If the random number is less than PK, then a kill occurs, the number of vehicles killed on the KRFth round for this case (RNDREC) is incremented, the number of vehicles killed (NVEHKL) on this replication is incremented and a return occurs. If not, ABRTTL is called and then the return occurs.

9.36 PPLOT Subroutine.

This subroutine is currently just a "stub" that producess a "\$\$" program generated comment saying that no printer plot was produced for the current case.

If implemented, this routine would produce printer plots (bar graphs) giving a graphical presentation of case results.

9.37 PSMOKE Subroutine.

This routine calculates the probability that smoke aborts the potential COPPERHEAD mission. This probability is a function of the number of each of two types of smoke rounds fired (NSMK2 and NSMK5) and the distribution of Pasquill atmospheric stability categories, distribution of wind speed velocities, and distribution of relative humidity levels corresponding to the current case's weather (i.e., month and time of day).

The entire routine reduces to evaluating PSMKKL (probability smoke kills mission) according to the formula:

$$\begin{aligned} \text{PSMKLL} &= \frac{1}{\text{FRONT}} \sum_{I=1}^{3} \sum_{J=1}^{3} \sum_{K=1}^{2} \left\{ \text{MIN} \left(\frac{\text{NSMK2}}{\text{SMK2}(I,J,K)} + \frac{\text{NSMK5}}{\text{SMK5}(I,J,K)}, \text{FRONT} \right) * \right. \\ & \left. \text{WNDSPD}(I,J) * \text{HUMID}(K) * \left[\text{PASQL}(2*I-1) + \text{PASQL}(2*I) \right] \right\} \end{aligned}$$

where all of the variables are as defined in the Glossary of Variables (Chapter 12).

Note that because certain combinations of windspeed and Pasquill category never occur, the SMK2(I,J,K) and SMK5(I,J,K) values' corresponding to them have been left blank (i.e., equated to zero). To avoid the division by zero that would otherwise result, the range of J in the summation is sometimes limited in the routine to avoid certain SMK2 and SMK5 values which should have no weight in the sum anyway.

9.38 REINTZ Subroutine.

This subroutine resets certain counter arrays to zero. It also resets the random number seeds for each case and on the first case it writes the seeds on Tape 8.

Note that the seeds are set according to the formula:

$$IR(I) = 2*(MOD(8**I, 29) *2**25/29) + 1$$

for $I = 1, 2, \dots, 28$.

This assures that each IR is odd and that the IR's are approximately uniformly spaced between 0 and 2^{26} .

9.39 RNDREL Subroutine.

This subroutine performs the test of round reliability (test 15). $\label{eq:test-test} % \begin{array}{c} \text{This subroutine performs the test of round reliability} \\ \text{This subroutine performs the test of round reliability} \\ \text{This subroutine performs the test of round reliability} \\ \text{This subroutine performs the test of round reliability} \\ \text{This subroutine performs the test of round reliability} \\ \text{This subroutine performs the test of round reliability} \\ \text{This subroutine performs the test of round reliability} \\ \text{This subroutine performs the test of round reliability} \\ \text{This subroutine performs the test of round reliability} \\ \text{This subroutine performs the test of round reliability} \\ \text{This subroutine performs the test of round reliability} \\ \text{This subroutine performs the test of round reliability} \\ \text{This subroutine performs the test of round reliability} \\ \text{This subroutine performs the test of round reliability} \\ \text{This subroutine performs the test of round reliability} \\ \text{This subroutine performs the test of round reliability} \\ \text{This subroutine performs the test of round reliability} \\ \text{This subroutine performs the test of round reliability} \\ \text{This subroutine performs the test of round reliability} \\ \text{This subroutine performs the test of round reliability} \\ \text{This subroutine performs the test of round reliability} \\ \text{This subroutine performs the test of round reliability} \\ \text{This subroutine performs the test of round reliability} \\ \text{This subroutine performs the test of round reliability} \\ \text{This subroutine performs the test of round reliability} \\ \text{This subroutine performs the test of round reliability} \\ \text{This subroutine performs the test of round reliability} \\ \text{This subroutine performs the test of round reliability} \\ \text{This subroutine performs the test of round reliability} \\ \text{This subroutine performs the test of round reliability} \\ \text{This subroutine performs} \\$

9.40 RNGCHK Subroutine.

This subroutine performs test 3.

It compares designator-to-target range at unmask to the maximum designator range. If the maximum designator range is less than the designator-to-target range, ABRTTL is called and a return occurs; otherwise, the test is passed and a return occurs.

9.41 SEPREC Subroutine.

This subroutine takes a real array A of dimension N1 and breaks it up into fields (i.e., separates records) and compresses them one per line into the B array which is of dimension N2 by N3.

The routine first clears several arrays to be used in separating the fields on A. Then it calls IDCHAR once for each element of A to determine what kind of character it is. A is assumed to be an array (usually DIMENSION A(80)) of characters filled by reading one input card under 80A1 format.

If the routine encounters sequence numbers in columns 73-78 of the first card (i.e., elements 73-78 of array A) and blanks in 63-72 and 79-80, then it issues a "\$\$\$" comment (see section 7.1) and removes the sequence numbers on the first card and all subsequent cards (A arrays) of the current run. If it encounters something other than the blanks and sequence numbers as described above in columns 63-80 of the first card, then it leaves columns 73-78 unchanged on all cards of the current run.

Next the program separates the fields on the card (i.e., in A) and compresses them into B. It does this by copying one character at a time from A to PB omitting blanks (except when part of a ten

character string preceded by a "\$" sign) and starting a new line of PB every time a separator (comma, left or right parenthesis, question mark, or slash) is encountered. It then encodes each line of PB into a line of B so that each element of B contains up to ten characters.

This means that B(I,J) for $I=1,2,\ldots,8$ contains the characters of the Jth field of the input card compressed by removing blanks (with the exception noted) and packed ten characters per word (until the characters run out).

A return now occurs with the B array filled with the character strings to be compared to the keywords and option words allowed.

Note that an input card cannot have more than ten fields nor fewer than one. A field on an input card (or in A) is defined as a string of characters lying between two successive separators where for this definition we include the beginning of the card and the end of the card as separators and do not count characters that would otherwise be separators if they lie in a ten character string following a dollar sign. (The normal separators are mentioned above in this section).

9.42 SMOKE Subroutine.

It compares the value of PSMKKL calculated in PSMOKE with a random number sampled from a uniform distribution to determine whether smoke was sufficient to abort the potential Copperhead mission. As usual, if an abort occurs, ABRTTL is called prior to returning; otherwise, an immediate return occurs.

9.43 SMPLCD Subroutine.

This subroutine randomly samples from a cummulative distribution. As arguments, it takes an array A, its dimensions ND1, ND2, the row number NRS containing the values to be sampled, the number of entries NDR used in the row (NDR \leq ND1), and the random number seed IRNDM. It returns the value sampled XSMPL and the class ICLASS in which it falls.

This routine requires an array A with A(I,1) for I = 1,2,., NDR \leq ND1 consisting of probabilities A(1,1) = 0.0 \leq A(2,1) \leq ... A(NDR,1) = 1.0. The routine samples a random number RN from a uniform distribution (from 0 to 1) and then brackets this number with two entries from A(I,1) such that A(I,1) \leq RN \leq A(I+1,1).

The corresponding entries A(I,NRS) and A(I+1,NRS) from the NRSth row of A are obtained. The value sampled XSMPL is then defined by straight line interpolation, (i.e., XSMPL is defined so that the point (RN, XSMPL) lies on the line segment joining (A(I,1), A(I,NRS)) to (A(I+1,1), A(I+1,NRS))).

Put in terms of a formula, that means:

XSMPL = A(I,NRS) + (RN-A(I,1))*(A(I+1,NRS)-A(I,NRS))/(A(I+1,1) -A(I,1)).

ICLASS is then defined to be equal to I and a return occurs.

Note that A defines a cummulative distribution. That is, when sampling.

$$Pr(XSMPL \leq A(I,NRS)) = A(I,1)$$
 for $I = 1,2,...,NDR$.

Hence, the user must take care to use only cummulative distributions for the input data that will eventually be sampled.

9.44 TIMCHK Subroutine.

This subroutine performs test 11 (i.e., does the DO still have line-of-sight to the target when the battery is ready to fire?)

It is called only for the "shooting gallery" LOS model.

9.45 TITLE Subroutine.

This routine merely writes the Title page of the output (see Chapter 6). It also sets the date and time that the current run began.

9.46 USET Subroutine.

This subroutine is called when the next case to be run is to use the baseline (default) values of the case parameters as the base to which its own input cards are to be applied.

The routine sets the UVALUE common block and a few other variables to their default values. Whatever inputs the next case then contains are applied to changing these variables from their defaults rather than from the previous cases values.

9.47 VISCHK Subroutine.

This subroutine performs test 2.

It compares designator-to-target range at unmask to the visibility range limit. If the visibility range limit is less than the designator-to-target range, ABRTTL is called and a return occurs; otherwise, the test is passed and a return occurs.

9.48 WARNDO Subroutine.

This subroutine performs test 13.

If the current round is the first of this COPPERHEAD mission, then a random number is sampled from a uniform distribution and compared to the probability that DO is warned to lase to determine whether the DO received the message to begin lasing. If he did receive the message, the test is passed and a return occurs; if not, ABRTTL is called prior to returning.

If the current round is \underline{not} the first round of this COPPERHEAD fire mission, then DO is assumed to have been warned either by communication or by sighting the impact of the first round and, in either case, turns on his laser so test 13 is passed and a return occurs.

CHAPTER 10

10. MEMORY ORGANIZATION: COMMON BLOCKS AND EQUIVALENCE CLASSES

10.1 Common Blocks.

This chapter describes the common blocks and equivalence classes in COPE. This organization of the values stored in memory is a matter of some importance to anyone attempting to modify the program.

Tables 10-1 and 10-2 give, respectively, a list of the common blocks in each subprogram of COPE and a list of the subroutines in which each common block occurs.

10.2 Equivalence Classes.

Table 10-3 gives the equivalence classes. There are twelve equivalence classes used in COPE (some are used in more than one subroutine). The equivalence classes are described below in alphabetical order of the names of their first items. Eight of the twelve equivalence classes are the eight data blocks referred in Section 4.5.1.:

ACQDAT is the Acquisition Range data block, AINVDA is the Invariant data block, DFSDAT is the Direct Fire Suppression data block, PEDATA is the Probability of Engagement data block, STDAT is the Target Posture Distribution data block, RODATA is the Random Occurrence data block, RSPDAT is the Response Time data block, and WDATA is the Weather data block.

These data block equivalence classes (along with a MAX equivalence class which has nothing to do with COPE's use of PREPMS) are also present in the PREPMS program.

Each equivalence class is formed by an equivalence statement establishing that one array or non-subscripted variable occupies the same memory locations as a set of one or more other arrays or non-subscripted variables. In each case the one array or non-subscripted variable (after which the equivalence class is named in Table 10-3) occupies all of the computer memory used by that equivalence class and so is dimensioned with a value equal to the entire length of the equivalence class (if the length is 1, then the equivalence class occupies but one word of computer memory and the class is named after a non-subscripted variable).

In Table 10-3, the information about each equivalence class is separated by dashed lines and is read as follows:

The first entry on the left gives the name of the equivalence class.

The next entry (length) gives the length of the equivalence class in terms of the words of computer memory occupied by the members of the equivalence class. This length is also the dimension of the array (or non-subscripted variable if length is one) in the first entry.

The entries under "MEMBERS" give bias, name, and length of each member. That is, for each member (variable) of the equivalence class (other than the member in the first entry above) there are three items given: first the bias or number of words preceding the variable in that equivalence class in computer memory space, second the variable (or array) name, and third the length of the array (or non-subscripted variable) in terms of computer words (one for non-subscripted variables).

Note that for each equivalence class, the memory space occupied is part (or all) of some common block. This correspondence is as follows:

ACQDAT is in the RNGLOS common block, AINVDA is in the HIT common block, D is in the DVALUE common block, DFSDAT is in the DODF common block, ICODE is in the ICODE common block, PEDATA is in the HIT common block, PSTDAT is in the HIT common block, RECODE is in the RECNAM common block, RODATA is in the RANDOC common block, RSPDAT is in the RSPTIM common block, U is in the UVALUE common block, and WDATA is in the WEATHR common block.

Also, note that the variables in an equivalence class may be used (under their names in the COMMON statements) in subprograms other than those in which the equivalence class is defined.

TABLE 10-1 COMMON BLOCKS IN EACH SUBPROGRAM OF THE COPE PROGRAM

SUBPROGRAM	COMMON	BLOCKS					
ABRTTL	ABORT	FLAG	RPLCTN				
ADDTBR	TIME						
ADDTOF	TIME						
ARTCHK	KTEST	MISC	RANDOM	RPLCTN			
BDATA1	ABRLBL LOGFLG	ACHAR POINT	DESRNG SMOKED	DISPLY STITLE	FLTTIM SYMBOL	FSRESP XVALUE	HEADNG
вгоснк	BAIL	KTEST	RANGE	RPLCTN	TARGET	TIME	
CCPLOT	RUNDAT						
COMMNT	COMENT						
COPE	ABRLBL FLTTIM SMOKED	ACHAR FSRESP STITLE	BAIL HEADNG SYMBOL	DESRNG LOGFLG TIME	DISPLY POINT XVALUE	DODF RPLCTN	FLAG RUNDAT
CREAD	DODF	ніт	RANDOC	RNGLOS	RSPTIM	WEATHR	
DETCTN	FLAG	KTEST	RANDOM	RPLCTN	RSPTIM	TIME	
DFAULT	DVALUE	RUNDAT					
DFCHK	DODF WEATHR	KTEST	RANDOM	RANGE	RPLCTN	TARGET	TIME
DUST	KTEST	MISC	RANDOM	RPLCTN			
ECHO	BAIL PEDESC RUNDAT	DOBF RANDOC SMOKED	FLAG RANGE TARGET	HIT RECNAM TIME	LOGFLG RNGLOS WEATHR	MISC RPLCTN	OVER RSPTIM
FINDIT	ACHAR	ICODE	INDEX1	RUNDAT	SYMBOL		
GETRNG	RANDOM	RANGE	RNGLOS	RPLCTN	TARGET	TIME	WEATHR
GETTIM	FLAG TIME	FSRESP	KTEST	LOGFLG	RANDOM	RPLCTN	RSPTIM
GETVIS	RANDOM	RANGE	RPLCTN	WEATHR			
HEADER	BAIL OVER SMOKED	COMENT PEDESC SYMBOL	DISPLY RANGE TARGET	FLAG RECNAM TIME	HEADNG RPLCTN UVALUE	LOGFLG RSPTIM	MISC RUNDAT
нітснк	HIT TIME	KTEST	MODINAR	RANGE	RPLCTN	RSPTIM	TARGET
IDCHAR	SYMBOL						

TABLE 10-1 COMMON BLOCKS IN EACH SUBPROGRAM OF THE COPE PROGRAM - CONTINUED

SUBPROGRAM	COMMON	BFOCKS					
INITLZ	ABORT UVALUE	ACHAR	DVALUE	FLAG	ICODE	INDEXI	RUNDAT
INPUT	ABORT FLAG OVER RNGLOS TIME	BAIL FLTTIM PEDESC RPLCTN UVALUE	COMENT HIT POINT RSPTIM WEATHR	DESRNG ICODE RANDOC RUMDAT	BISPLY INDEX1 RANDOM SMOKED	DODF LOGFLG RANGE SYMBOL	DVALUE MISC RECNAM TARGET
L09СИК	FLAG TIME	KTEST	RANDOC	RANDOM	RANGE	RPLCTN	TARGET
MINTEN	H111	KTEST	RANDOM	RANGE	RFLCTN	TARGET	TIME
NOREC	LCODE						
NUMRIC	SYMBOL						
TUGTUO	ABORT SCCSS	ABRLBL	DODE	FLAG	KTEST	RPLCTN	RUNDAT
PECHK	FLAG TARGET	HIT TIME	KTEST WEATHR	RANDOM	RANGE	RPLCTN	RSPTIM
PENAME	XVALUE						
ькснк	HIT	KTEST	RANDOM	RPLOTN	scoss	TARGET	
PPLOT	RUNDAT						
PSMOKE	SMOKED	WEATHR					
REINTZ	ABORT	KTEST	RANDOM	RPLOTN	sccss		
RNDREL	KTEST	MISC	RANDOM	RPLCTN			
RNGCHK	KTEST	RANGE	RPLCTN				
SEPREC	COMENT	LOGFLO	SYMBOL.				
SMOKE	KTEST	RANDOM	RPLCTN	SMOKED	WEATHR		
TIMCHK	FLAG	KTEST	RPLOTN	TIME			
TITLE	RUNDAT	STITLE					
USET	DVALUE	LOGELG	OVER	UVALUE			
VISCHK	KTEST	RANGE	RPLCTN				
WARNDO	FLAG	KTEST	RANDOM	RPLCTN	RSPTIM	TIME.	

TABLE 10-2 SUBPROGRAMS OF COPE IN WHICH EACH COMMON BLOCK OCCURS

COMMON	SUBPROG	RAMS		· · · · · · · · · · · · · · · · · · ·			· · · · · · · · · · · · · · · · · · ·
ABORT	ABRTTL	INITLZ	INPUT	оитрит	REINTZ		
ABRUBU	BDATA1	OUTPUT					
ACHAP	BDATA1	FIMDIT	INTTLZ				
BAIL	впоснк	COPE	ECHO	HEADER	INPUT		
COMENT	COMMNT	HEADER	INPUT	SEPREC			
DESRNG	EDATA1	INPUT					
DISPLY	BDATA1	HEADER	INPUT				
DODE	COPE	CREAD	DECHK	ECHO	INPUT	OUTPUT	
DVALUE	DFAULT	INTTLZ	INPUT	USET			
FLAG	ABRTTL IMPUT	COPE LOSCHK	DETCTN OUTPUT	ECHO PECHK	GETTIM TIMCHK	HEADER WARNDO	INITLZ
FLTTIM	BDATA1	INPUT					
FSRESP	BDATA1	GETTIM					
HEADNG	BDATA1	HEADER					
ніт	CREAD	ECHO	нітськ	INPUT	MINTRN	PECHK	PKCHK
ICODE	FINDIT	INITLZ	INPUT	NOREC			
INDEX1	FINDIT	INITLZ	INPUT				
KTEST	ARTCHK LOSCHK RNGCHK	BLOCHK MINTRN SMOKE	DETCTN OUTPUT TIMCHK	DFCHK PECHK VISCHK	DUST PKCHK WARNDO	GETTIM REINTZ	HITCHK RNDREL
LOGFLG	BDATA1	ECH0	GETTIM	HEADER	INPUT	SEPREC	USET
MISC	ARTCHK	TRUG	ECHO	HEADER	INPUT	RNDREL	
OVER	ECHO	HEADER	INPUT	USET			
PEDESC	ECHO	HEADER	INPUT				
POINT	BDATA1	INPUT					
RANDOC	CREAD	ECHO	INPUT	LOSCHK			
RANDOM	ARTCHK HITCHK RNDREL	DETCTN INPUT SMOKE	DECHK LOSCHK WARNDO	DUST MINTRN	GETRNG PECHK	GETTIM PKCHK	GETVIS REINTZ
RANGE	BLOCHK INPUT	DFCHK LOSCHK	ECHO MINTRN	GETRNG PECHK	GETVIS RNGCHK	HEADER VISCHK	нітснк

TABLE 10-2 SUBPROGRAMS OF COPE IN WHICH EACH COMMON BLOCK OCCURS - CONT'D

COMMON	SUBPROC	GRAMS					
RECNAM	ECHO	HEADER	INPUT				
RNGLOS	CREAD	ECHO	GETRNG	INPUT			
RPLCTN	ABRTTL ECHO LOSCHK RNGCHK	SMOKE MINTRN SMOKE	BLOCHK GETTIM OUTPUT TIMCHK	COPE GETVIS PECHK VISCHK	DETCTN HEADER PKCHK WARNDO	DECHK HITCHK REINTZ	DUST INPUT RNDREL
RSPTIM	CREAD PECHK	DETCTN WARNDO	ECHO	GETTIM	HEADER	нітенк	INPUT
RUNDAT	CCPLOT INPUT	COPE OUTPUT	DFAULT PPLOT	ECHO TITLE	FINDIT	HEADER	INITLZ
SCCSS	OUTPUT	PKCHK	REINTZ				
SMOKED	BDATA1	ЕСНО	HEADER	INPUT	PSMOKE	SMOKE	
STITLE	BDATA1	TITLE					
SYMBOL	BDATA1	FINDIT	HEADER	IDCHAR	INPUT	NUMBIC	SEPREC
TARGET	BLOCHK LOSCHK	DFCHK MINTRN	ECHO PECHK	GETRNG PKCHK	HEADER	НІТСНК	INPUT
TIME	ADDTBR GETRNG PECHK	ADDTOF GETTIM TIMCHK	BLOCHK HEADER WARNDO	COPE HITCHK	DETCTN INPUT	DECHK LOSCHK	ECHO MINTRN
UVALUE	HEADER	INITLZ	INPUT	USET			
WEATHR	CREAD PSMOKE	DFCHK SMOKE	ECH0	GETRNG	GETVIS	INPUT	PECHK
XVALUE	BDATA1	PENAME					

TABLE 10-3 COPE EQUIVALENCE CLASS	TARLE 10-3	COPE	EOUIVALENCE	CLASSES
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NAME (Name of First Item)	LENGTH		EMBERS Name -	Length
ACQDAT	161	0 1 2 3 25 146 157	RNGCLB	1 22 121 11
(Occurs in subroutines CREAD	and INPUT) 			
AINVDA (Occurs in subroutines CREAD	167 and INPUT)	0 6 26 27 47	DLTT PKTBL NRNGTT RNGTTF TTF	20 1 20
D (Occurs in subroutine INPUT)	70	0	DVALUE	70
DFSDAT (Occurs in subroutine CREAD	31		DFDOKL NDFSP	30 1
ICODE (Occurs in subroutines FINDI	l T, INITLZ, and	O INPUT)	CODE	1
PEDATA (Occurs in subroutines CREAD	4260 and INPUT)	0 60	INDEX PETBL	60 4200

TABLE 10-3 COPE EQUIVALENCE CLASSES - CONT'D

NAME (Name of First Item)	LENGTH	Bias	MEMBERS Name	Length
PSTDAT	41	0 1 11	NRNGPS RNGPST PSTTBL	1 10 30
(Occurs in subroutines	CREAD and INPUT)			
RECODE	8	0 1 2 3 4 5 6 7	WCODE ACCODE RSCODE DFCODE ROCODE PECODE PSCODE AICODE]]]]]]
(Occurs in subroutine (HEADER)	, . 	MOODL	'
RODATA (Occurs in subroutines	22 CREAD and INPUT)	0 1 2 12	TCRIT NPLOSR RNGPLS PRBLOS	1 1 10 10
RSPDAT (Occurs in subroutines	49 CREAD and INPUT)	0 3 5 6 10 14 18 22 42 43	BATRTM XMVADF DUM1 BCSPTM XMTTIM TMEAN TSIGMA DETTMA NDT TRARRY	3 2 1 4 4 4 4 20 1

TABLE 10-3 COPE EQUIVALENCE CLASSES - CONT'D

NAME (Name of First Item)	LENGTH	Bias	MEMBERS Name	Length
U (Occurs in subroutines	70 HEADER and IN	0 PUT)	UVALUE	70
WDATA	193	0 1 3 25 157 168 174 175 176 182 191	PRCLCG PRCFLS PRGCFL W VIS CLOUD NCC NVL PASQL WNDSPD HUMID	1 2 22 132 11 6 1 1 6 9
(Occurs in subroutines	CREAD and INP	UI)		

CHAPTER 11

11. FLOWCHARTS

This chapter includes flowcharts of the COPE main program and subroutine INPUT. Flowcharts of the other subroutines are not included since they are generally simple enough to understand by reading the descriptions in chapter 9 and studying the actual program code with the aid of the glossary of variables in chapter 12.

Several conventions are observed in the flowcharts. First, connectors on-page are indicated by circles whereas connectors off-page are indicated by pentagons. Numbered connectors correspond to actual statement numbers in the program code whereas letter connectors are merely flowcharting conveniences. Each STOP block in the flowchart includes the section number of this report that explains that stop.

A list of abbreviations used in the flow charts is included on the next page.

ABBREVIATIONS USED IN FLOW CHARTS

acq	Acquisition	OM	Option word
CLGP	COPPERHEAD	param	parameterized
C.O.	Completely obscured	pr	priority
comt	comment	prob	probability
desig	designator	rd(s)	round(s)
DF	direct fire	resp	response
dgt	digital	R.N.	random number(s)
D.O.	designator operator	rng	range
F.E.	fully exposed	SG	shooting gallery
fn	function	smk	smoke
H.D.	hull defilade	supp	suppression
hdng	heading	temp	temporary
KW	keyword	tgt	target
max	maximum	vel	velocity
mo	month	vis	visibility
ms g	message	w/	with
msn	mission	#	number
no	number		

night

option

nt opt Flowchart of Main Program of COPE

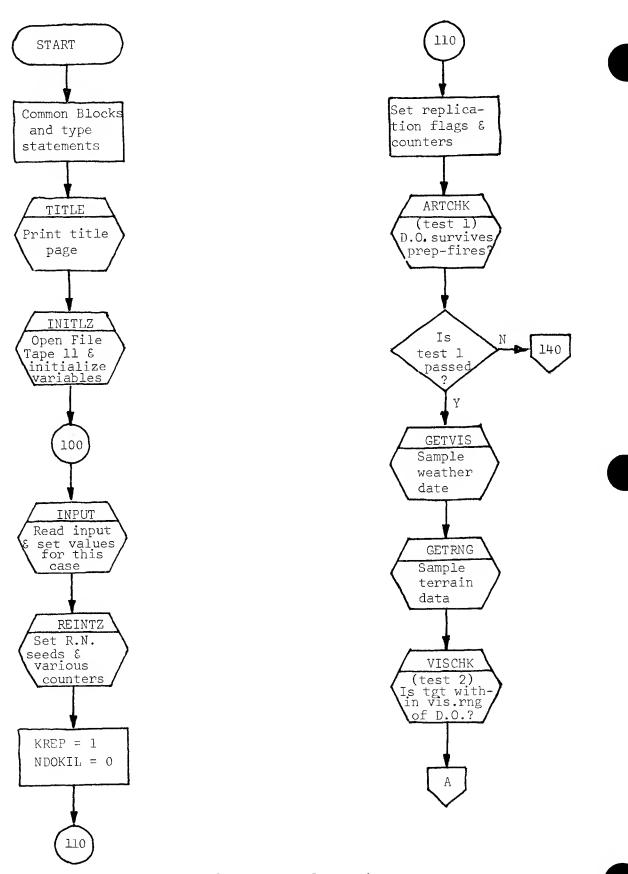
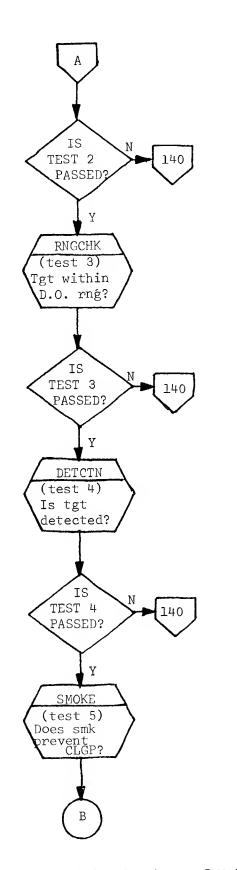


FIGURE 11-1 Flowchart of Main Program of COPE (Page 1 of 5)



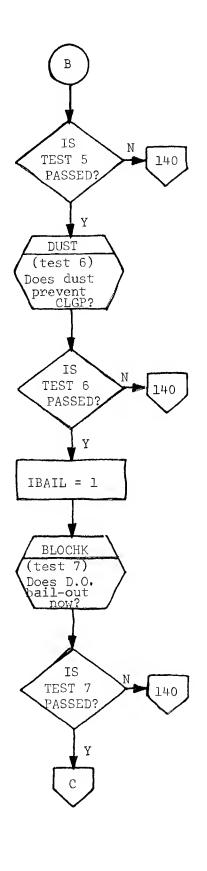


FIGURE 11-1 Flowchart of Main Program of COPE (Page 2 of 5)

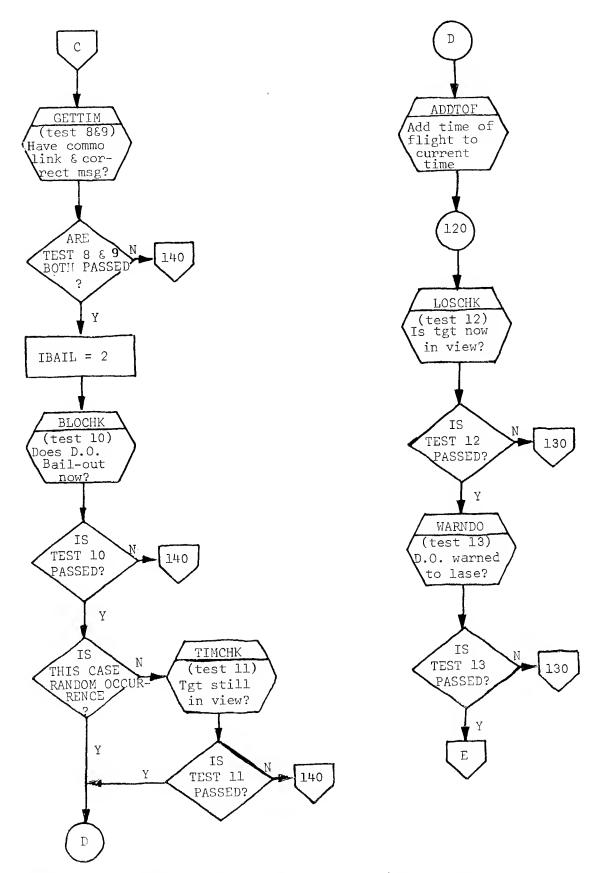
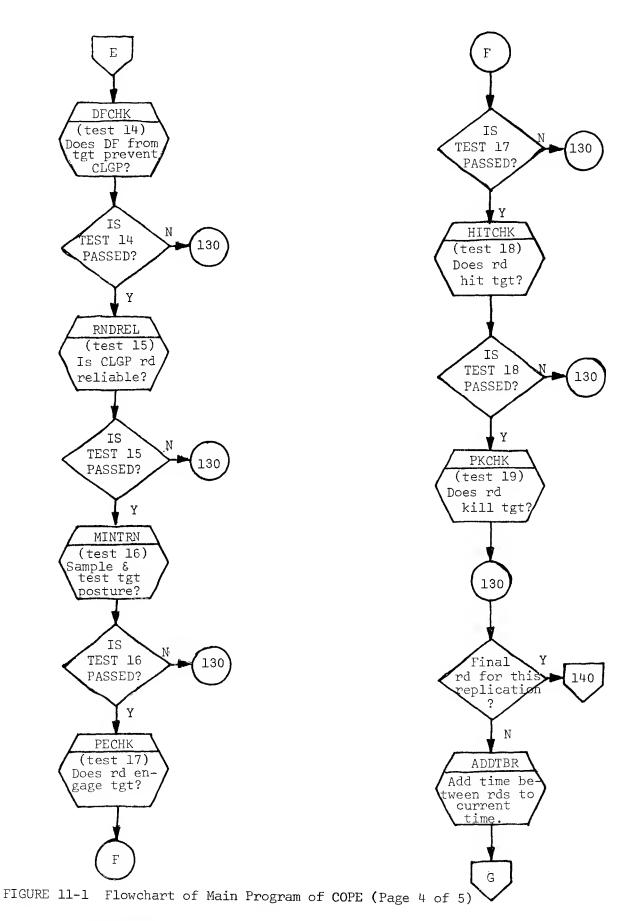
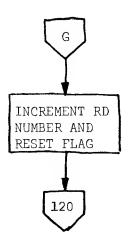


FIGURE 11-1 Flowchart of Main Program of COPE (Page 3 of 5)





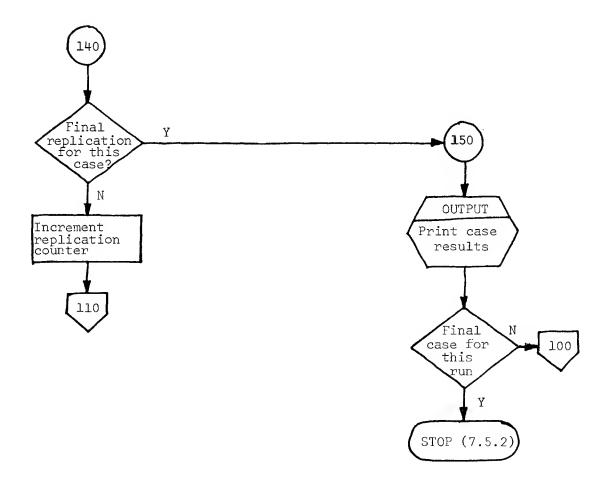
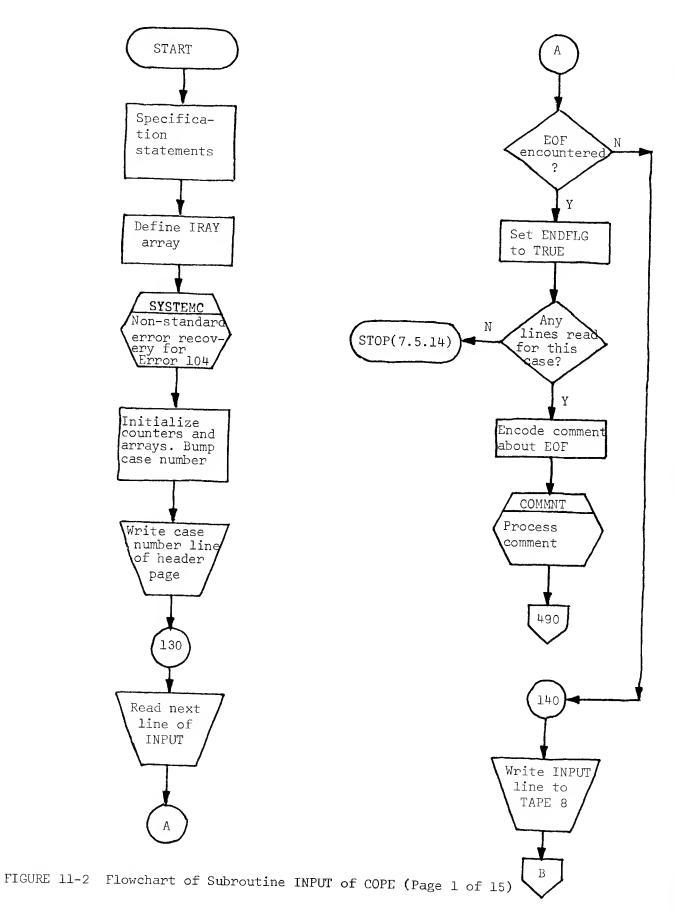


FIGURE 11-1 Flowchart of Main Program of COPE (Page 5 of 5)

Flowchart of Subroutine INPUT of COPE



11-10

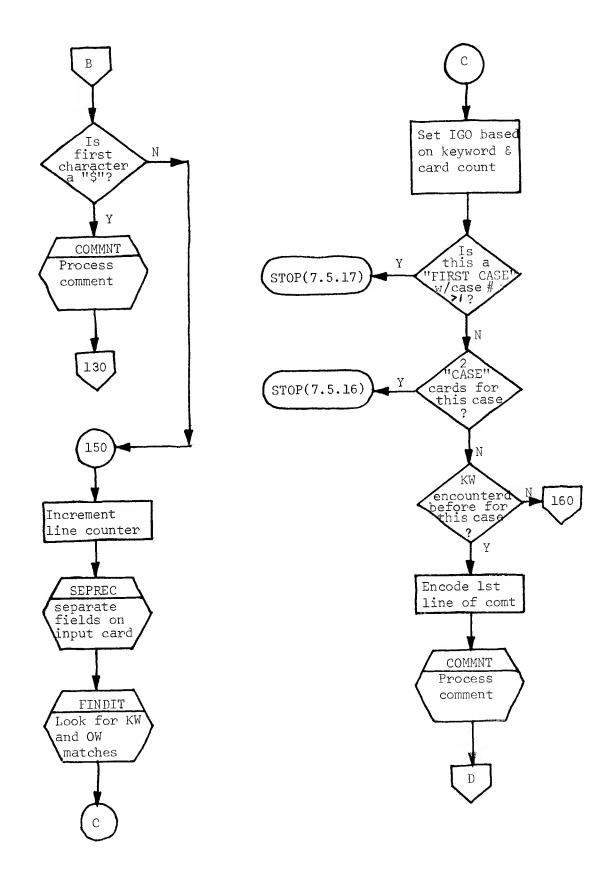


FIGURE 11-2 Flowchart of Subroutine INPUT of COPE (Page 2 of 15)

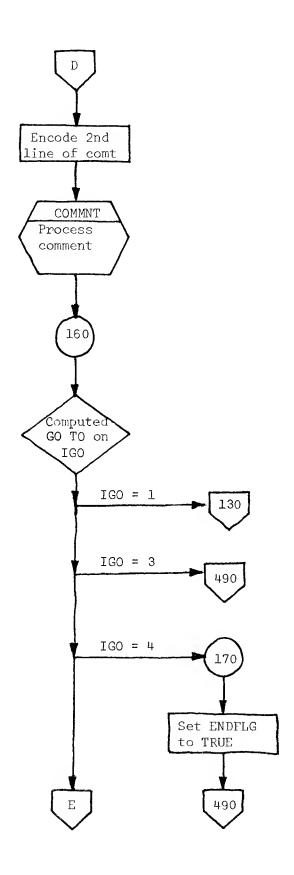


FIGURE 11-2 Flowchart of Subroutine INPUT of COPE (Page 3 of 15)

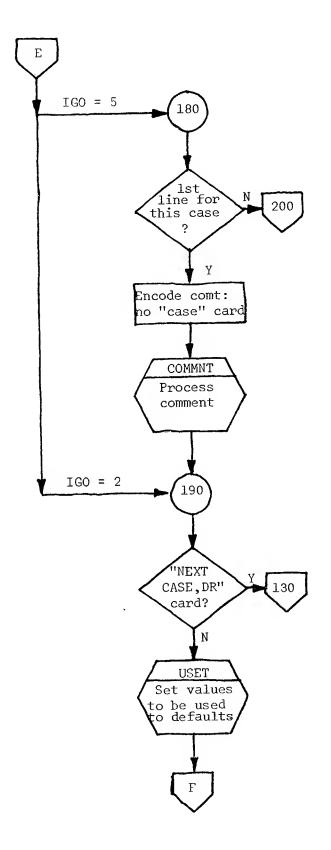


FIGURE 11-2 Flowchart of Subroutine INPUT of COPE (Page 4 of 15)

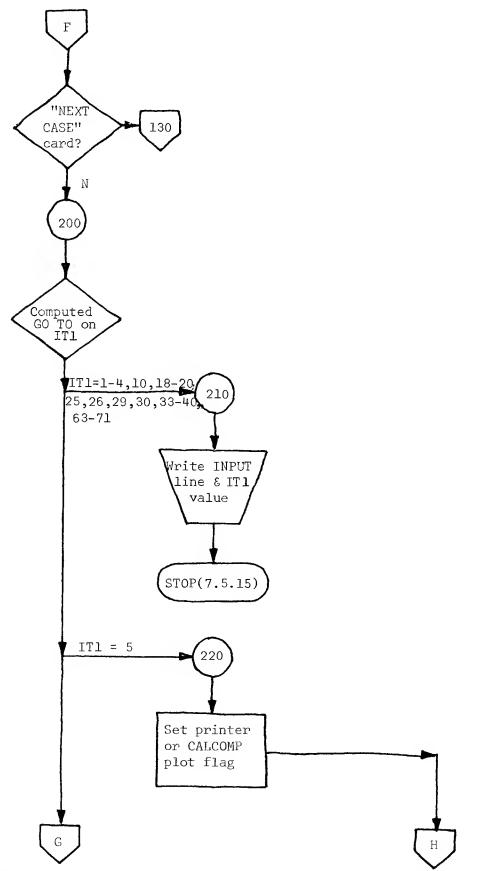


FIGURE 11-2 Flowchart of Subroutine INPUT of COPE (Page 5 of 15)

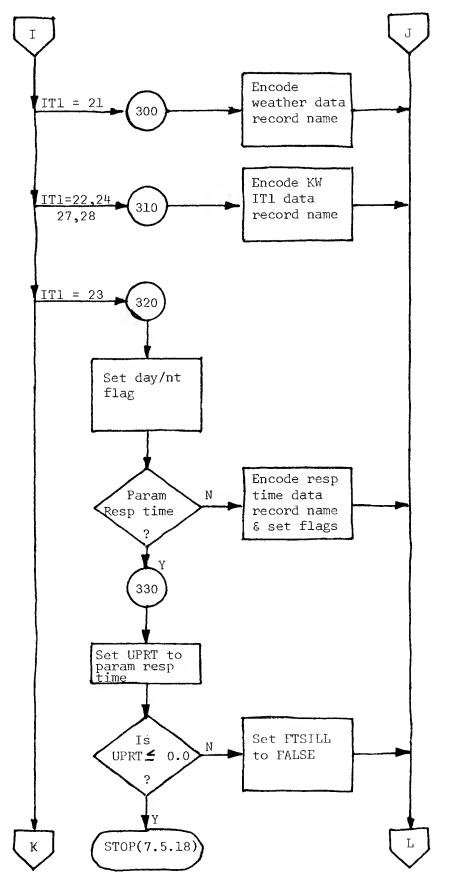


FIGURE 11-2 Flowchart of Subroutine INPUT of COPE (Page 7 of 15)

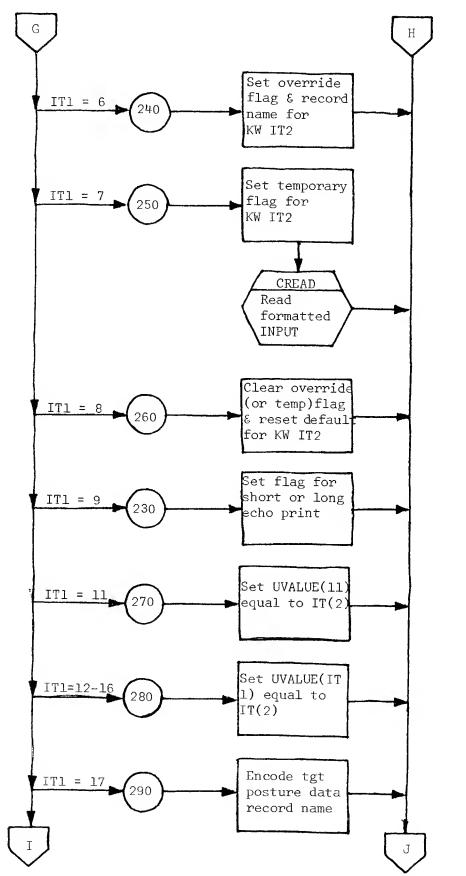


FIGURE 11-2 Flowchart of Subroutine INPUT of COPE (Page 6 of 15)

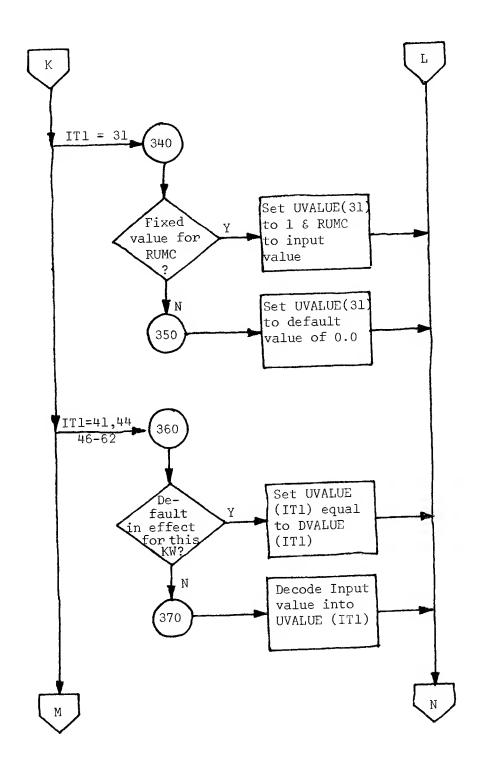


FIGURE 11-2 Flowchart of Subroutine INPUT of COPE (Page 8 of 15)

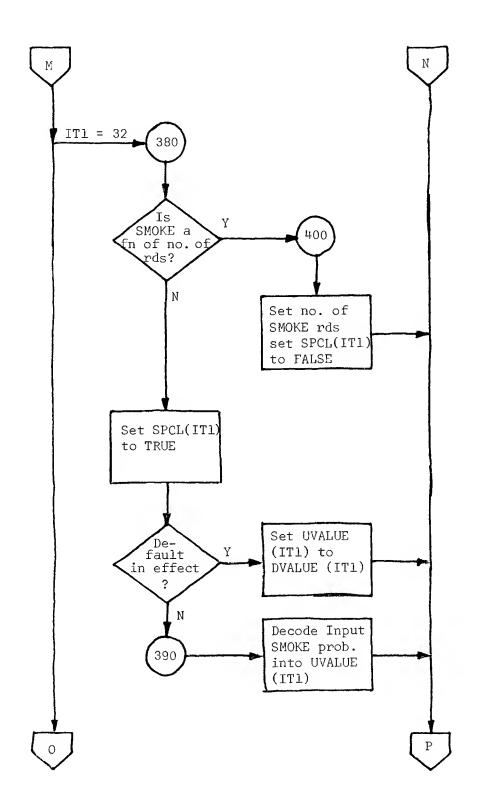


FIGURE 11-2 Flowchart of Subroutine INPUT of COPE (Page 9 of 15)

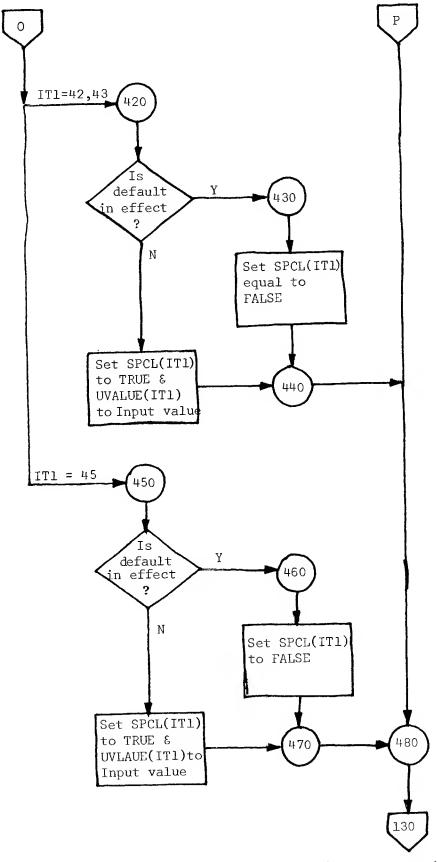


FIGURE 11-2 Flowchart of Subroutine INPUT of COPE (Page 10 of 15)

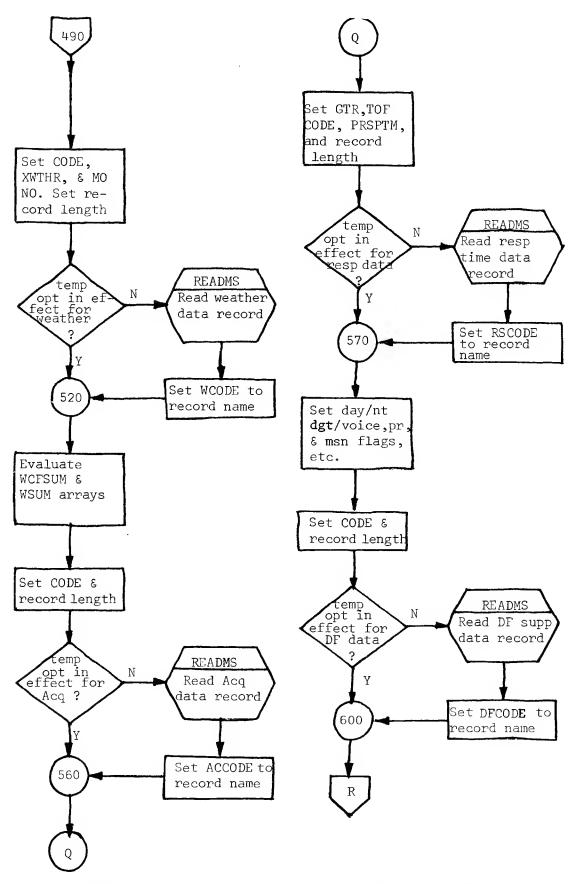


FIGURE 11-2 Flowchart of Subroutine INPUT of COPE (Page 11 of 15)

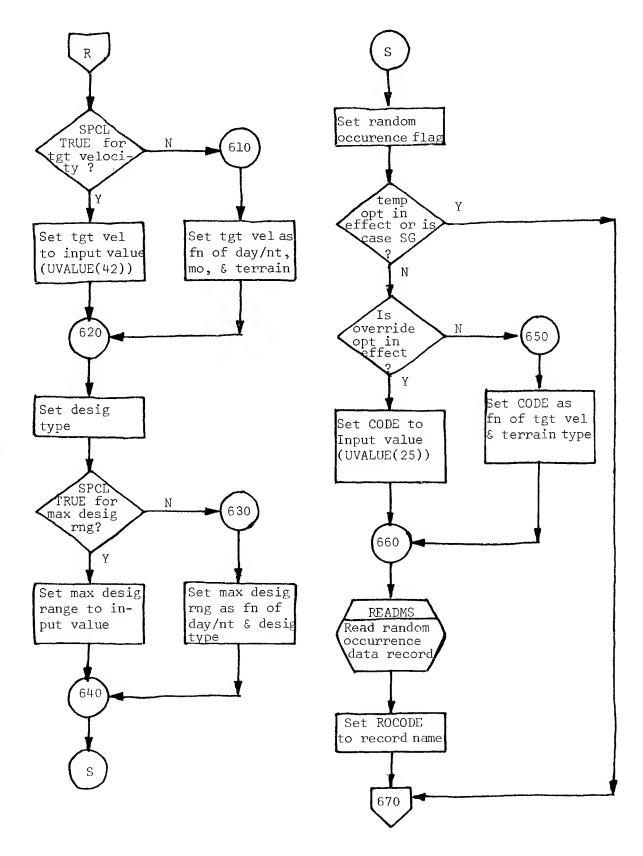


FIGURE 11-2 Flowchart of Subroutine INPUT of COPE (Page 12 of 15)

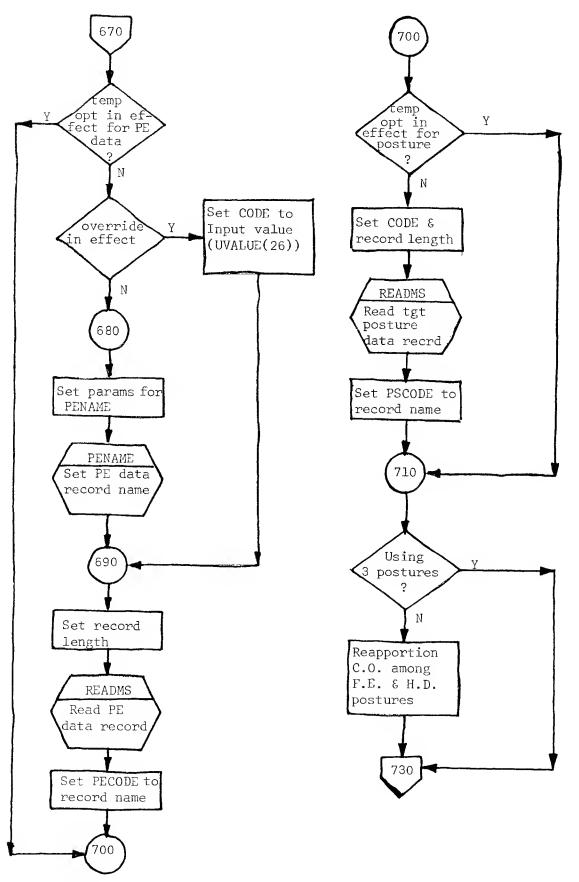


FIGURE 11-2 Flowchart of Subroutine INPUT of COPE (Page 13 of 15)

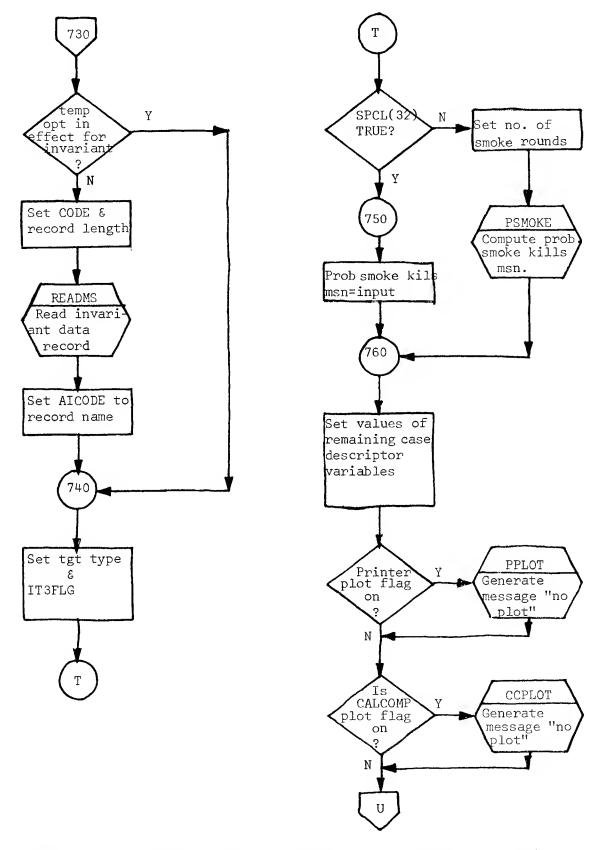


FIGURE 11-2 Flowchart of Subroutine INPUT of COPE (Page 14 of 15)

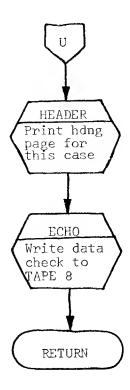


FIGURE 11-2 Flowchart of Subroutine INPUT of COPE (Page 15 of 15)

CHAPTER 12

12. GLOSSARY OF MAIN COPE PROGRAM VARIABLES

This chapter consists of a glossary of variables for the main COPE program. (Glossaries for the PREPMS and PRBLOS preprocessor programs are respectively, included in sections 14.3 and 15.3. No glossary is provided in this report for the PAM preprocessor program.)

The glossary consists of an alphabetical list of the variable names. For each variable name, there is an entry giving VARIABLE, TYPE, COMMON BLOCK, UNITS, and DEFINITION.

Under the VARIABLE heading is the variable name and, if the variable is an array, the array dimensions are given in parentheses after the name.

Under the TYPE column, the variable type is given; if the type is omitted, it means the FORTRAN type default is in effect (i.e., a variable beginning with letter I, J, K, L, M, or N is integer type whereas one beginning with any other letter is single precision real type).

Under the COMMON BLOCK column is the name of the common block (if any) to which the variable belongs. If this column contains "(LOCAL)", it means the variable is a local variable; if it contains "(F.P.)", it means the variable is a formal parameter in a FUNCTION or SUBROUTINE.

Under the UNITS column is the name of the units of measure in which the variable is to be given. If a blank occurs in this column, it means that the variable is unitless.

Finally, under the DEFINITION heading is a brief description of the variable.

GLOSSARY OF HAIN COPE PROGRAM VARIABLES

VARIABLE	TYPE	COMMON BLOCK	UNITS	DEFINITION
A(80) A(N)		(LOCAL) (F.P.)		ARRAY INTO WHICH INPUT LINE IS READ BY SUBROUTINE INPUT. A(I) IS THE ITH CHARACTER IN THE IMPUT LINE. ALSO USED AS A FORMAL PARAMETER TO RECEIVE COMMENTS IN SUBROUTINE COMMIT OR TO PASS INPUT LINE TO SUBROUTINE SEPREC TO UNSTRING KEYWORDS AND OPTION WORDS.
ABRPCT(20, 6)		(LOCAL)		ABRPCT(I, J) IS THE PERCENT OF THE TOTAL NUMBER OF REPLICATIONS THAT ABORTED FOR ITH ABORT REASON ON ROUND J. IF ABRPCT(I, J) IS UNDEFINED, IT IS SET EQUAL TO -1.
ACCODE		RECNAM		RECORD NAME KEY FOR THE ACQUISITION DATA RECORD LAST READ FROM THE WORD ADDRESSABLE MASS STORAGE FILE (TAPE 11).
ACQDAT(161)		(LOCAL)		ARRAY TO WHICH ELEMENTS OF ACQUISITION RANGE DATA BLOCK ARE EQUIVALENCED.
ACQLBL(2, 4)		HEADNG		ALPHANUMERIC DESCRIPTOR OF THE TERRAIN TYPE USED FOR CURRENT CASE. IT IS USED TO LABEL THE "TERRAIN AND LOS" BLOCK OF THE OUTPUT HEADING.
AICODE		RECNAM		RECORD NAME KEY FOR THE "INVARIANT" DATA RECORD LAST READ FROM THE WORD ADDRESSABLE MASS STORAGE FILE (TAPE 11).
AINVDA(167)		(LOCAL)		ARRAY TO WHICH ELEMENTS OF INVARIANT DATA BLOCK ARE EQUIVALENCED.
ALF		(רסכער)		TEMPORARY NAME FOR THE ALPHA PARAMETER OF THE GAMMA DISTRIBUTION USED TO SAMPLE DIGITAL MESSAGE DEVICE DELAY TIME.
ALFBET(27)		SYMBOL		ALFBET(I) IS THE ITH LETTER OF THE ALPHABET FOR I=1,2,,26 ALFBET(27) IS AN APOSTROPHE. THESE SYMBOLS ARE ALL STORED IN A1 FORMAT.
ALPHA		(F.P.)		ALPHA IS THE 'SHAPING FACTOR' OF THE GAMMA DISTRIBUTION.
ALPHA(2, 2)		RSPTIM		ALPHA(I, J) IS THE ALPHA PARAMETER TO BE USED WITH THE GAMMA DISTRIBUTION (I=1 FOR DAY, I=2 FOR NIGHT, J=1 FOR A PRE-PLANNED TARGET, AND J=2 FOR A TARGET OF OPPORTUNITY).
ANGLET		PEDESC DEG (F.P.)	DEGREES	THE ANGLE BETWEEN THE GUN-TARGET LINE AND THE DESIGNATOR-TARGET LINE.
ANUMBR(11)		SYMBOL		ANUMBR(I)=I-1 FOR 1 <i<10. a="" anumbr(11)="" are="" at="" format.<="" in="" is="" minus="" sign.="" stored="" td="" these=""></i<10.>

DEFINITION	ARRAY INTO WHICH THE FIRST COLUMN OF CASE HEADING OUTPUT BLOCKS ARE ENCODED PRIOR TO BEING PRINTED OUT IN SUBROUTINE HEADER.	ARRAY USED TO TEMPORARILY STORE VALUES USED IN CREATING AND DECIPHERING PROBABILITY OF ENGAGEMENT RECORD NAME KEYS USED TO READ TAPE 11.	USED IN FUNCTION URAN31 TO COMPUTE PSEUDO-RANDOM NUMBER.	B(I, J) CONTAINS CHARACTERS 10*(I-1)+1 THROUGH 10*I OF THE JTH KEYWORD OR OPTION WORD OF THE MOST RECENTLY READ NON-COMMENT INPUT LINE STORED IN A10 FORMAT WITH MOST BLANKS REMOVED.	BATRIM(I) IS THE TIME USED BY THE FIRING BATTERY FROM THE TIME IT RECEIVES A COPPERHEAD FIRE MISSION ORDER FROM THE FDC UNTIL IT IS READY TO FIRE THE FIRST COPPERHEAD ROUND OF THAT MISSION. I=1 FOR PRE-PLANNED TARGETS, I=2 FOR TARGETS OF OPPORTUNITY, I=3 FOR PRIORITY PRE-PLANNED TARGETS.	BCSPTM(I, J) IS THE TIME REQUIRED FOR THE BATTERY COMPUTER SYSTEM TO PROCESS THE COPPERHEAD FIRE MISSION REQUEST. I=1 FOR DIGITAL COMMUNICATIONS, I=2 FOR VOICE COMMUNICATIONS; J=1 FOR PRE-PLANNED TARGETS, J=2 FOR TARGETS OF OPPORTUNITY.	BETA(I, J) IS THE SCALING FACTOR TO BE USED WITH THE GAMMA DISTRIBUTION (I=1 FOR DAY, I=2 FOR NIGHT; J=1 FOR PREPLANNED TARGETS, J=2 FOR TARGETS OF OPPORTUNITY).	BLANK IS A BLANK SYMBOL (ONE EMPTY PRINT SPACE) STORED IN A1 FORMAT.	BLORNG IS THE DESIGNATOR BAIL-OUT RANGE.	ARRAY INTO WHICH SECOND COLUMN OF CASE HEADING OUTPUT BLOCKS ARE ENCODED PRIOR TO BEING PRINTED OUT IN SUBROUTINE HEADER.	C(I) IS THE ITH CHARACTER OF AN OPTION WORD THAT IS BEING CHECKED TO DETERMINE WHETHER IT IS NUMERIC. (STORED IN A) FORMAT.)
UNITS					SECONDS	SECONDS	SECONDS		METERS		
COMMON BLOCK	(7)	۲)	T)	(T)				7.	_	/L)	١٢)
COMMO	(LOCAL)	(L0CAL)	(LOCAL)	(LOCAL) (F.P.)	RSPTIM	RSPTIM	RSPTIM	SYMBOL	BAIL	(LOCAL)	(LOCAL)
TYPE											
VARIABLE	AOUT(4, 40)	AVALUE(9)		B(8, 10) B(M, N)	BATRTM(3)	ВСЅРТМ(2, 2)	BETA(2, 2)	ANK	BLORNG	BOUT(4, 40)	30)
VAR	AOU	AVA	A1	B(8 B(M	BAT	BCS	BET	BLANK	BLC	108	(80)

DEFINITION	CHAR(I, J) FOR I>2 CONTAINS CHARACTERS 10*(I-3)+1 THROUGH 10*(I-2) OF THE JTH KEYWORD CHARACTER STRING IN A10 FORMAT. CHAR(1, J) IS THE KEYWORD NUMBER AND CHAR(2, J) IS THE NUMBER OF OPTION WORD CHARACTER STRINGS ALLOWED WITH JTH KEYWORD.	CHAR(I, J) FOR I>2 CONTAINS CHARACTERS 10*(I-3)+1 THROUGH 10*(I-2) OF THE JTH OPTION WORD CHARACTER STRING IN A10 FORMAT CHARA(1, J) IS THE OPTION WORD CHOICE NUMBER AND CHARA(2, J) IS THE NUMBER INDICATING THE LEVEL (POSITION NUMBER) OF THE OPTION WORD.	CLOUD CEILING ALTITUDE. (NOT ACTUALLY USED AFTER IT IS SET). THE INDEX OF THE CLOUD CEILING ALTITUDE (ICC) IS THE NUMBER USED TO ACCESS DATA THAT DEPENDS ON CLOUD CEILING ALTITUDE.)	ARRAY OF CLOUD CEILING ALTITUDE VALUES.	CONTAINS COMMENT LINE GENERATED BY PROGRAM AND READY TO BE PROCESSED BY SUBROUTINE COMMNT.	CMENT(I, J) CONTAINS CHARACTERS $10*(I-1)+1$ THROUGH $10*I$ OF THE JTH LINE OF COMMENTS TO BE PRINTED WITH THE CURRENT CASE	CODE AND ICODE ARE EQUIVALENT. (SEE ICODE)	ARRAY INTO WHICH THIRD COLUMN OF CASE HEADING OUTPUT BLOCKS ARE ENCODED PRIOR TO BEING PRINTED OUT IN SUBROUTINE HEADER.	COMMENT BUFFER. IF FOR ANY COPE CASE THE NUMBER OF \$\$ COMMENTS EXCEEDS THE SECOND DIMENSION OF THE CMENT ARRAY (ORIGINALLY SET AT 20), THEN THE COMMENT THAT CAUSES THE OVERFLOW IS STORED IN COMBUF AND AN ERROR PRINT OCCURS FOLLOWED BY A STOP WITH MESSAGE.	CUMULATIVE ACQUISITION RANGE DISTRIBUTION. CRNG(I, 1) IS THE PROBABILITY THAT THE ACQUISITION RANGE IS LESS THAN OR EQUAL TO CRNG(I, 2). (CRNGD(I,1) IS UNITLESS; CRNG(I, 2) IS IN METERS).	DEFAULT VALUES FOR PARAMETERS ASSOCIATED WITH KEYWORDS.	DATE OF RUN FOR CURRENT COMPUTER JOB. (OBTAINED FROM COMPUTER'S INTERNAL CALENDAR.)
UNITS			METERS	METERS						NONE, METERS		
COMMON BLOCK	ACHAR	(LOCAL)	(LOCAL)	WEATHR	(LOCAL)	COMENT	(LOCAL)	(LOCAL)	COMENT	RNGLOS NOT	DVALUE	RUNDAT
VARIABLE	СНАR(10, 120)	CHARA(10, 30)	CLDCLG	(P) (C	CM(10)	CMENT(13, 20)	CODE	COUT(4, 40)	COMBUF(13)	CRNG(11, 2)	0(70)	DAT

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VARIABLE TYPE	COMMON BLOCK	UNITS	DEFINITION
DAYLBL(2)	HEADNG		ALPHANUMERIC LABELS USED IN LABELING OUTPUT HEADINGS AS DAY OR NIGHT.
DOT	DVALUE		NOT USED.
DECFLG	(L0CAL)		<pre>IF DECFLG=1.0, A DECIMAL POINT HAS BEEN ENCOUNTERED IN C ARRAY; IF DECFLG=0.0. NO DECIMAL POINT HAS BEEN ENCOUNTERED IN C ARRAY.</pre>
DECPNT	SYMBOL		ALPHANUMERIC SYMBOL FOR DECIMAL POINT STORED IN A1 FORMAT.
DEFB	PEDESC(LOCAL) IN PENAME)	METERS	DEFLECTION BIAS (DISTANCE FROM FOOTPRINT CENTROID TO POINT OF CLOSEST APPROACH OF TARGET).
DELTAT	(L0CAL)	SECONDS	TIME ROUND ARRIVES ON TARGET MINUS TIME LAST TARGET VEHICLE IN COLUMN PASSES POINT OF CLOSEST APPROACH TO FOOTPRINT CENTROID. IF DELTAT AS COMPUTED ABOVE IS NEGATIVE, THEN A VALUE OF ZERO IS USED.
DESRNG(3, 2)	DESRNG	METERS	DESRNG(I,J) IS THE MAXIMUM DESIGNATOR RANGE FOR THE ITH DESIGNATOR TYPE AND THE JTH DAY OR NIGHT CONDITION (J=1 FOR DAY, J=2 FOR NIGHT).
DETTIM	RSPTIM	SECONDS	TIME FROM TARGET UNMASK TO OBSERVER'S CALL FOR COPPERHEAD.
DETTMA(10, 2)	RSPTIM	NONE, SEC	DETECTION TIME CUMULATIVE DISTRIBUTION ARRAY. DETTMA(1,1) IS THE PROBABILITY THAT DETECTION TIME IS LESS THAN OR EQUAL TO DETTMA(1,2).
DFCODE	RECNAM		RECORD NAME KEY FOR THE DIRECT FIRE DATA RECORD LAST READ FROM THE WORD ADDRESSABLE MASS STORAGE FILE (TAPE 11).
DFDOKL(10,3)	DODF	METERS, NONE	DFDOKL(I,1) IS THE ITH RANGE CLASS UPPER LIMIT: DFFOKL(I,2) IS THE PROBABILITY THAT DIRECT FIRE OBSCURES DESIGNATOR'S VIEW OF TARGET AT RANGE DFDOKL(I,1) BUT DOES NOT KILL DESIGNATOR: DFDOKL(I,3) IS THE PROBABILITY THAT DIRECT FIRE KILLS THE DESIGNATOR AT RANGE DFDOKL(I,1).
DFSDAT	(L0CAL)	METERS	ARRAY TO WHICH ELEMENTS OF DIRECT FIRE SUPPRESSION DATA BLOCK ARE EQUIVALENCED.
DFSLBL(2,2)	HEADNG		ARRAY CONTAINING LABELS FOR DIRECT FIRE SUPPRESSION LEVEL PRINT OUT.
DGTLBL(2,2)	HEADNG		ARRAY CONTAINING LABELS FOR COMMUNICATIONS PRINT OUT.

GLOSSARY - CONTINUED DEFINITION	DEFAULT COMMUNICATIONS TYPE (DIGITAL).	DEFAULT DAY OR NIGHT TIME (DAY).	MEAN DISTANCE BETWEEN CONSECUTIVE VEHICLES IN TARGET COLUMN.	DISPM(I) IS THE FIRST THREE LETERS OF THE ITH MONTH NAME USED IN PROGRAM. (A3 FORMAT)	DISPT(I) IS THE FOUR DIGIT TIME OF DAY FOR THE ITH TIME OF DAY PLAYED. (A4 FORMAT)	ARRAY OF DELAY TIME VALUES USED FOR INTERPOLATING IN PROB- ABILITY OF ENGAGEMENT ARRAY.	PROBABILITY DESIGNATOR HAS BEEN KILLED BY PREPARATORY ARTILLERY FIRES.	FLAG USED TO INDICATE THAT DESIGNATOR HAS BEEN KILLED BY DIRECT FIRE. (TRUE = KILLED; FALSE = NOT KILLED)	ARRAY OF DESIGNATOR LOCATION LABELS USED FOR PRINT OUT.	DOLLAR SIGN SYMBOL IN AI FORMAT.	DEFAULT VALUE FOR PARAMETERIZED RESPONSE TIME.	DEFAULT NUMBER OF SMOKE ROUNDS FIRED BY RED. DSMK(1) FOR TYPE 1 SMOKE ROUNDS: DSMK(2) FOR TYPE 2 SMOKE ROUNDS.	DESIGNATOR-TO-TARGET RANGE.	DUMMY VARIABLE NO LONGER USED (BUT RETAINED TO AVOID CHANGING COMMON BLOCK SIZE).	DURATION OF LINE-OF-SIGHT (TIME FROM WHEN FIRST VEHICLE IN COLUMN UNMASKS UNTIL LAST VEHICLE IN COLUMN LEAVES LINE-OF- SIGHT SEGMENT).	DVALUE(I) IS EQUIVALENT TO D(I).	TIME TO ENTER FIRE REQUEST ON DIGITAL MESSAGE DEVICE.	FLAG INDICATING NO FURTHER CASES TO BE READ.	FLAG INDICATING REPLICATION (OR FIRING OF ROUND) IS TO BE ENDED.
GLOSSARY	DEFA	DEFA	MEAN	DISPI USED	DISP DAY F		PROB/ ARTIL	FLAG	ARRAY	DOLLA		DEFAU TYPE	DESIG	DUMMY	DURAT COLUM SIGHT	DVALU	TIME	FLAG	FLAG 1
UNITS			METERS			SECONDS					SECONDS		METERS		SECONDS		SECONDS		
COMMON BLOCK	DVALUE	DVALUE	TARGET	DISPLY	DISPLY	HIT	MISC	DODF	HEADNG	SYMBOL	DVALUE	DVALUE	RANGE	RSPTIM	TIME	(LOCAL)	(LOCAL)	FLAG	FLAG
TYPE								LOGICAL										LOGICAL	LOGICAL
VARIABLE	DIDIGT	NGIO	DISBVH	DISPM(12)	DISPT(24)	DLTT(6)	DOARPK	DOKILD	DOLBL (3,2)	DOLLAR	DPRT	DSMK(2)	DTRNG	DUMT	DURLOS	DVALUE (70)	EDDTIM	ENDFLG	ENDREP

USED T9 CALCULATE FDT2.	USED FOR INTERPOLATING WITH RESPECT TO DELAY TIME IN THE PROBABILITY OF ENGAGEMENT TABLES.	FLAG USED TO INDICATE FIRST INPUT LINE IN CHECKING FOR SEQUENCE NUMBERS.	FUNCTION VALUE, SPECIAL FORMATTING OF PERCENTAGES USED FOR PRINT OUT.	USED TO INTERPOLATE WITH RESPECT TO RANGE IN THE DFDOKL ARRAY.	WIDTH OF FRONT WHICH RED WANTS TO SMOKE.	FT SILL'S CUMULATIVE RESPONSE TIME DISTRIBUTION. FSRT(I,1) IS THE PROBABILITY THAT THE TOTAL DESIGNATOR-FDC-BATTERY RESPONSE TIME IS LESS THAN OR EQUAL TO FSRT(I,2).	TOTAL DESIGNATOR-FDC-BATTERY RESPONE TIME AS SAMPLED FROM FSRT ARRAY WHEN USING FT SILL RESPONSE TIME DISTRIBUTION.	FLAG TO INDICATE WHETHER FT SILL RESPONSE TIME DISTRIBUTION IS BEING USED.	FUNCTION VALUE. GAMMA DISTRIBUTED RANDOM VARIABLE.	GUN-TO-TARGET RANGE AS USED IN SUBROUTINE PENAME.	GUN-TO-TARGET RANGE.	HUMID(I) IS THE PROBABILITY THAT THE RELATIVE HUMIDITY FALLS IN CLASS I. (IF I=1, RELATIVE HUMIDITY <65%; IF I=2, RELATIVE HUMIDITY >65%; IF I=2,	USED AS CONTROL VARIABLE IN VARIOUS DO-LOOPS AND IMPLIED DO- LOOPS. ALSO USED AS A FORMAL PARAMETER (RANDOM NUMBER SEED AND SUBSCRIPT) AND A COUNTER.	INDEX NUMBER OF CAUSE OF MISSION (OR ROUND) ABORT.	LENGTH OF ACQUISITION DATA RECORD ON WORD ADDRESSABLE MASS STORAGE FILE (TAPE 11).
UNITS					Z.	NONE, SECONDS	SECONDS			X	Z				
COMMON BLOCK	(LOCAL)	LOGFLG	FUNCTION	(LOCAL)	SMOKED	FSRESP	(LOCAL)	LOGFLG	FUNCTION	(F.P.)	PEDESC	WEATHR	(LOCAL) (F.P.)	(LOCAL) (F.P.)	(LOCAL)
TYPE		LOGICAL						LOGICAL							
VARIABLE	FDT1 FDT2	FIRSTL	FPRCNT	FRAC	FRONT	FSRT(14,2)	FSRTIM	FTSILL	GAMMA	GTR	GTRNG	HUMID(2)	Н	IABRT	IACQRL

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VARIABLE	TYPE	COMMON BLOCK	UNITS	DEFINITION
IATENG		(LOCAL)		NUMBER OF ATTEMPTED ENGAGEMENTS FOR THE CURRENT CASE.
IB		(LOCAL & F.P.)		USED AS SECOND SUBSCRIPT OF B ARRAY IN NUMRIC AND FINDIT.
IBAIL		BAIL		FLAG INDICATING WHICH BAIL-OUT CHECK IS BEING MADE. IBAIL=1 INDICATES PRE-COMMUNICATIONS CHECK; IBAIL=2 INDICATES POST-COMMUNICATIONS CHECK.
10		(LOCAL)		CONTROL VARIABLE FOR IMPLIED DO-LOOP IN DECODE STATEMENT. ALSO AN UNUSED RETURNED PARAMETER FROM A CALL TO SMPLCD.
100		WEATHR		ICC INDICATES WHICH OF THE SIX CLOUD CEILING ALTITUDES IS BEING USED ON THIS REPLICATION. IF CLOUD FREE LINE-OF-SIGHT EXISTS, ICC=1 (HIGHEST CEILING) IS USED.
ICCPFG		RUNDAT		CALCOMP PLOT FLAG. ICCPFG=O INDICATES NO CALCOMP PLOT HAS BEEN REQUESTED FOR THE CURRENT CASE: ICCPFG=1 INDICATES THAT CALCOMP PLOT OUTPUT HAS BEEN REQUESTED.
ICFL0S		(LOCAL)		CLOUD FREE LINE-OF-SIGHT FLAG. ICFLOS=1 INDICATES A CLOUD FREE LINE-OF-SIGHT; ICFLOS=2 INDICATES NO CLOUD FREE LINE-OF-SIGHT.
ICHNL		(LOCAL)		NUMBER OF OPTION WORDS IN CHARA ARRAY TO BE CHECKED IN SEARCH FOR MATCH WITH OPTION WORDS OF CURRENT KEYWORD.
ICHRRL		(†0CAL)	,	NUMBER OF WORDS IN OPTION WORD DATA RECORD ON WORD ADDRESSABLE MASS STORAGE FILE (TAPE 11).
ICLASS		(LOCAL) (F.P.)		WHEN A CUMULATIVE DISTRIBUTION IS SAMPLED USING THE SMPLCD SUBROUTINE, THE VALUE RETURNED IN ICLASS IS THE NUMBER OF THE INTERPOLATION INTERVAL FROM WHICH THE SAMPLE WAS OBTAINED.
ICLNGF		(LOCAL)		CLOUD CEILING FLAG. ICLNGF=1 INDICATES A CLOUD CEILING; ICLNGF=2 INDICATES NO CLOUD CEILING (I.E., SCATTERED CLOUDS)
I CMF L G		(L0CAL)		COMMENT FLAG. ICMFLG=O INDICATES NO TIME OF DAY/WEATHER INCONSISTENCY COMMENT WILL BE PRINTED FOR THIS CASE; ICMFLG=1 INDICATES SUCH A COMMENT WILL BE PRINTED.
I CMNT		COMENT		NUMBER OF \$\$ COMMENT LINES TO BE PRINTED FOR THIS CASE.
ICODE		ICODE		RECORD NAME KEY WHEN READING FROM WORD ADDRESSABLE MASS STORAGE FILE (TAPE 11). ICODE IS EQUIVALENT TO CODE.

DEFINITION	INDEX NUMBER USED TO CHECK WHETHER MORE THAN ONE INPUT LINE HAS BEEN READ WITH THE SAME KEYWORD FOR EACH CASE.	ALPHANUMERIC DESCRIPTORS OF CAUSES OF MISSION (OR ROUND) ABORTS. IDABRT(I,J) CONTAINS CHARACERS 10*(I-1)+1 THROUGH 10*I OF ABORT DESCRIPTOR NUMBER J.	FUNCTION VALUE. A NUMERICAL VALUE USED TO INDICATE TO WHICH CLASS OF SYMBOLS A GIVEN CHARACTER BELONGS.	A NUMERICAL VALUE INDICATING TO WHICH CLASS OF SYMBOLS A PARTICULAR CHARACTER BELONGS.	RECORD NAME KEY FOR A PROBABILITY OF ENGAGEMENT DATA RECORD TO BE READ OR INTERPRETED.	SUBSCRIPT OF INDEX ARRAY USED WHEN DELTAT IS ZERO.	SUBSCRIPT OF INDEX ARRAY USED FOR INTERPOLATION WHEN DELTAT IS POSITIVE.	SUBSCRIPT OF INDEX ARRAY USED FOR INTERPOLATION WHEN DELTAT IS POSITIVE (IDELT2=IDELT1+1).	<pre>IDFL=1 INDICATES HIGH LEVEL OF DIRECT FIRE SUPPRESSION; IDFL=2 INDICATES NO DIRECT FIRE SUPPRESSION. (IDFL IS USED TO PRINT CASE HEADING LABELS.)</pre>	DIRECT FIRE SUPPRESSION DATA RECORD LENGTH ON WORD ADDRES-SABLE MASS STORAGE FILE (TAPE 11).	FLAG TO INDICATE WHICH METHOD OF COMMUNICATION IS TO BE FIRST CHOICE WHEN DESIGNATOR CALLS REQUEST FOR FIRE TO FDC. (IDIGTL=1 INDICATES DIGITAL COMMUNICATION; IDIGTL=2 INDICATES VOICE COMMUNICATION.)	FLAG TO INDICATE DAY OR NIGHT. (IDN=1 INDICATES DAYTIME; IDN=2 INDICATES NIGHTIME.)	FLAG TO INDICATE DESIGNATOR OPERATOR LOCATION. (IDOLOC=1 INDICATES VANTAGE POINT LOCATION; IDOLOC=2 INDICATES MANEUVER UNIT LOCATION).	FLAG TO INDICATE DESIGNATOR TYPE. (IDSGTP=1 INDICATES GLLD, IDSGTP=2 INDICATES MULE, AND IDSGTP=3 INDICATES LTD).
UNITS														
COMMON BLOCK		ABRLBL	FUNCTION	(LOCAL)	(F.P.)	(LOCAL)	(LOCAL)	(LOCAL)	(LOCAL)	(LOCAL)	FLAG	FLAG	(LOCAL)	RSPTIM
TYPE														
VARIABLE	ICRD	IDABRT(3,19)	IDCHAR	IDCHR	IDCODE	IDELTT	IDELTI	IDELT2	I DFL	IDFSRL	IDIGTL	IDN	IDOLOC	IDSGTP

UNITS	FORMAL PARAMETER INDICATING DESIGNATOR TYPE. VALUES OF 1,2, AND 3 HAVE SAME MEANING AS FOR THE VARIABLE IDSGTP.	COMPUTED GO TO PARAMETER USED TO SEND CONTROL TO SECTION OF SUBROUTINE INPUT THAT HANDLES A PARTICULAR CLASS OF INPUT LINES.	GUN-TO-TARGET RANGE ROUNDED TO NEAREST INTEGER.	USED AS SUBSCRIPT FOR INDEXING PETBL ARRAY. ALSO USED AS DO-LOOP CONTROL VARIABLE.	USED AS SUBSCRIPT FOR INDEXING PETBL ARRAY.	USED AS SUBSCRIPT FOR INDEXING PETBL ARRAY.	CONTROL VARIABLE IN VARIOUS DO-LOOPS.	CONTROL VARIABLE IN DO-LOOP.	DO-LOOP CONTROL VARIABLE IN REINITIALIZING KTEST ARRAY.	CONTROL VARIABLE IN IMPLICIT DO-LOOP.	SUBSCRIPT OF KEYWORD CHARACTER STRING FOUND TO MATCH A CURRENT INPUT LINE CHARACTER STRING.	STORES SUBSCRIPT OF KEYWORD CHARACTER STRING MATCHING FIRST CURRENT INPUT LINE KEYWORD WHILE SECOND KEYWORD IS BEING CHECKED FOR A MATCH (APPLIES ONLY TO "TEMPORARY", "OVERRIDE" AND "RESET" KEYWORDS).	INDEX NUMBER OF MONTH OF CURRENT CASE'S WEATHER DATA. (E.G., IF JUNE AND DECEMBER ARE THE ONLY MONTHS PLAYED, IMNTH=1 FOR JUNE AND IMNTH=2 FOR DECEMBER).	FLAG AND SUBSCRIPT INDICATING WHETHER TARGET IS PAST THE POINT OF CLOSEST APPROACH TO THE CENTROID OF THE FOOTPRINT. (IMUTS=1 IF TARGET IS PAST POINT OF CLOSEST APPROACH; IMUTS=2 IF NOT).	NUMBER OF OPTION WORDS TO BE CHECKED FOR MATCH ON CURRENT INPUT LINE.	NUMBER OF GAMMA DISTRIBUTION RANDOM DEVIATES TO BE RETURNED
UNI			X													
COMMON BLOCK	(F.P.)	(L0CAL)	(LOCAL)	(LOCAL)	(LOCAL)	(LOCAL)	(LOCAL)	(LOCAL)	(LOCAL)	(LOCAL)	(LOCAL)	(LOCAL)	(L0CAL)	TARGET	(LOCAL)	(LOCAL)
TYPE																
VARIABLE	IDT	160	IGTR	11	111	112	U	Ν	IKTEST	11	IMATCH	IMATCH1	HTNMI	IMUTS	IMXNR	NI

DEFINITION	INDEXING ARRAY FOR REFERENCING PETBL ARRAY. INDEX(I,J,K) IS THE NUMBER OF THE PETBL TO BE USED FOR CLOUD CFILING I, VISIBILITY RANGE J, AND IMUTS VALUE K.	ARRAY CONTAINING MASTER INDEX FOR WORD ADDRESSABLE MASS STORAGE FILE (TAPE 11).	INVARIANT DATA RECORD LENGTH ON WORD ADDRESSABLE MASS STORAGE FILE (TAPE 11).	NUMBER OF OCCASIONS FOR THE CURRENT CASE (EQUAL TO NREP).	IOPTNM(I) IS THE NUMBER OF DIFFERENT OPTION WORD CHARACTER STRINGS ALLOWED FOR KEYWORD I.	<pre>IOVER(I)=1 INDICATES "OVERRIDE" OPTION IN EFFECT FOR KEY- WORD I; IOVER(I)=2 INDICATES "TEMPORARY" OPTION IN EFFECT FOR KEYWORD I.</pre>	PROBABILITY OF ENGAGEMENT DATA RECORD LENGTH ON WORD ADDRESSABLE MASS STORAGE FILE (TAPE 11).	IPOINT(I) IS THE VALUE OF THE COMPUTED GO TO PARAMETER THAT WILL SEND CONTROL THE PROPER PART OF SUBROUTINE INPUT FOR HANDLING KEYWORD I INPUTS.	PRINTER PLOT FLAG. IPPFG=1 INDICATES PRINTER PLOT OUTPUT REQUESTED FOR THIS CASE; IPPFG=0 INDICATES PRINTER PLOT OUTPUT NOT REQUESTED FOR THIS CASE.	PRE-PLANNED TARGET FLAG. IPREPL=1 INDICATES PRE-PLANNED TARGET; IPREPL=2 INDICATES TARGET OF OPPORTUNITY.	FLAG TO INDICATE WHETHER CURRENT RANDOM NUMBER SEEDS HAVE YET BEEN WRITTEN TO TAPE 8, IPRINT=O INDICATES THEY HAVE NOT; IPRINT=1 INDICATES THEY HAVE.	PRIORITY FLAG. IPRTY=2 INDICATES PRIORITY PRE-PLANNED TARGET; IPRTY=0 INDICATES NO SPECIAL PRIORITY.	ARRAY CONTAINING ERROR PROCESSING SPECIFICATIONS FOR CALL OF SYSTEMC SUBROUTINE FOR NON-STANDARD RECOVERY FOR CDC FORTRAN ERROR 104.	UNUSED VALUE RETURNED BY A CALL OF SUBROUTINE SMPLCD.
UNITS														
COMMON BLOCK	HIT	INDEXI	(LOCAL)	(LOCAL)	(LOCAL)	OVER	(LOCAL)	POINT	RUNDAT	FLAG	(LOCAL)	FLAG	(LOCAL)	(LOCAL)
TYPE														
VARIABLE	INDEX(6,5,2)	INDX11(2001)	INVORL	IOCSN	10PTNM(70)	IOVER(70)	IPERL	IPOINT(70)	IppFG	IPREPL	IPRINT	IPRTY	IRAY(6)	IRC

DEFINITION	INITIAL PARAMETER OF A DO-LOOP (IRF=1).	SUBSCRIPT USED IN INTERPOLATING WITH RESPECT TO RANGE IN RNGTTF ARRAY TO OBTAIN PROBABILITY OF HIT GIVEN AN ENGAGEMENT.	SUBSCRIPT USED IN INTERPOLATING WITH RESPECT TO RANGE IN PSTTBL ARRAY TO OBTAIN PROBABILITIES OF THE VARIOUS TARGET POSTURES. ALSO FORMAL PARAMETER FOR RANDOM NUMBER SEED IN GAMMA.	RANDOM NUMBER SEED TO BE USED WHEN CALLING URAN31 FROM SMPLCD.	RANDOM OCCURRENCE FLAG. IRNDOC=1 INDICATES RANDOM OCCURRENCE LINE-OF-SIGHT METHODOLOGY USED FOR THIS CASE; IRNDOC=0 INDI- CATES SHOOTING GALLERY LOS METHODOLOGY USED FOR THIS CASE.	LOWER LIMIT OF RANGE BRACKET USED TO INTERPOLATE IN PETBL ARRAY.	UPPER LIMIT OF RANGE BRACKET USED TO INTERPOLATE IN PETBL ARRAY.	RANDOM OCCURRENCE DATA RECORD LENGTH ON WORD ADDRESSABLE MASS STORAGE FILE (TAPE 11).	NUMBER OF THE ROW OF THE SEGLOS ARRAY TO BE USED IN SAMPLING FOR LINE-OF-SIGHT SEGMENT LENGTH ON THIS REPLICATION.	RESPONSE TIME DATA RECORD LENGTH ON WORD ADDRESSABLE MASS STORAGE FILE (TAPE 11).	ARRAY OF RANDOM NUMBER SEEDS. IR(1) IS EQUIVALENT TO IR1, IR(2) TO IR2, IR(28) TO IR28.	RANDOM NUMBER SEEDS. IR1 IS SEED FOR FIRST RANDOM NUMBER STREAM, IR2 FOR SECOND, ETC.	NUMBER OF REPLICATIONS OF CURRENT CASE THAT REACHED THE STAGE IN THE MISSION WHERE A ROUND WAS FIRED.	DO-LOOP INITIAL PARAMETER. ISTART IS THE SUBSCRIPT FOR THE FIRST LINE TO BE READ FROM CARDS AS RESULT OF A "TEMPORARY" OPTION FOR PEDATA.
UNITS						ΚM	ΚM							
COMMON BLOCK	(LOCAL)	(LOCAL)	(LOCAL) (F.P.)	(F.P.)	FLAG	(LOCAL)	(LOCAL)	(LOCAL)	(L0CAL)	(LOCAL)	(LOCAL)	RANDOM	(LOCAL)	(LOCAL)
TYPE														
VARIABLE	IRF	IRM	IRN	IRNDM	IRNDOC	I RNG1	IRNG2	IRORL	IROW	IRSPRL	IR(28)	IR1, IR2,, IR28	ISHOT	ISTART

DEFINITION	<pre>IT(1) = NUMBER OF CURRENT INPUT LINE'S KEYWORD. IT(3) IS THE NUMBER OF THE (J-1)ST OPTION WORD CHOICE OF THE CURRENT LINE FOR J>1.</pre>	FLAG FOR CURRENT COMMUNICATIONS MODE. ITDGTL=1 FOR DIGITAL; ITDGTL=2 FOR VOICE.	TARGET POSTURE FLAG. ITGTPS=1 FOR FULLY EXPOSED TARGET; ITGTPS=2 FOR HULL DEFILADE TARGET.	TARGET TYPE NUMBER. ITGTTP=1 FOR TARGET TYPE 1, ITGTTP=2 FOR TARGET TYPE 2, ETC.	ITIMDL=1 INDICATES FIRST METHOD OF MODELING RESPONSE TIME IS PLAYED (SINGLE DISTRIBUTION SAMPLED); ITIMDL=2 INDICATES SECOND METHOD OF MODELING RESPONSE TIME IS PLAYED (SINGLE VALUE USED); ITIMDL=3 INDICATES THIRD METHOD OF MODELING RESPONSE TIME IS PLAYED (ADDING CONTRIBUTIONS OF INDIVIDUAL DELAY COMPONENTS).	TARGET POSTURE DATA RECORD LENGTH FOR WORD ADDRESSABLE MASS STORAGE FILE (TAPE 11).	SUBSCRIPT INDICATING TERRAIN TYPE USED FOR CURRENT CASE. USED TO REFERENCE ACQLBL ARRAY FOR OUTPUT HEADING.	FLAG USED TO INDICATE WHETHER CURRENT ATTEMPT TO MATCH KEY-WORD IS FOR FIRST OR SECOND KEYWORD OF CURRENT INPUT LINE. APPLIES ONLY TO "TEMPORARY", "OVERRIDE", AND "RESET" FIRST KEYWORDS.	TARGET VELOCITY.	COMPUTED GO TO PARAMETER USED TO SEND CONTROL TO PROPER READ STATEMENTS WHEN "TEMPORARY" OPTION IS USED.	NUMBER OF CURRENT INPUT LINE'S FIRST KEYWORD.	NUMBER OF CURRENT INPUT LINE'S SECOND KEYWORD OR FIRST OPTION WORD.	NUMBER OF CURRENT INPUT LINE'S SECOND OPTION WORD.	FLAG USED TO INDICATE WHETHER RUMC IS TO BE CONSTANT. IF IT3FLG=0, RUMC VARIES FROM REPLICATION TO REPLICATION; IF IT3FLG=1, RUMC IS CONSTANT.
UNITS									METERS/SEC					
COMMON BLOCK	(LOCAL)	(L0CAL)	TARGET	TARGET	(LOCAL)	(LOCAL)	(LOCAL)	(L0CAL)	(LOCAL) ME	(LOCAL)	(LOCAL)	(LOCAL)	(LOCAL)	FLAG
TYPE														
VARIABLE	11(10)	ITDGTL	ITGTPS	ІТСТТР	ITIMOL	ITPSRL	ITRRN	ITRY	ITVEL	ITYPE	III	112	113	IT3FLG

DEFINITION	LOGICAL UNIT NUMBER TO WHICH OUTPUT OF SUBROUTINE ECHO IS TO BE WRITTEN. ALSO UNIT FROM WHICH "TEMPORARY" OPTION PEDATA IS TO BE READ IN SUBROUTINE CREAD.	VISIBILITY RANGE LIMIT FOR THIS REPLICATION.	VISIBILITY RANGE SUBSCRIPT VALUE FOR REFERENCING PETBL ARRAY (IVLA=IVL EXCEPT THAT IF IVL>10, THEN IVLA=10).	COUNTER INDICATING POSITION NUMBER OF THE KEYWORD OR OPTION WORD CURRENTLY BEING ANALYZED IN THE SEPREC SUBROUTINE.	WEATHER DATA RECORD LENGTH ON WORD ADDRESSABLE MASS STORAGE FILE (TAPE 11).	COUNTER USED IN SEPREC SUBROUTINE SEPARATION ALGORITHM.	IXXX=1 INDICATES GOOD WEATHER (CURRENTLY JUNE AND SEPTEMBER) IXXX=2 INDICATES BAD WEATHER (CURRENTLY MARCH AND DECEMBER) IXXX GOVERNS THE VALUE OF THE VELTBL ARRAY TO BE USED IN THE CURRENT CASE. (APPLICABLE ONLY IF TARGET VELOCITY DEFAULT IS IN EFFECT.)	CONTROL PARAMETER FOR IMPLIED DO-LOOPS.	CONTROL PARAMETER FOR IMPLIED DO-LOOPS. ALSO RECEIVING ARGU- MENT FOR DESIGNATOR TYPE IN CALL OF PEIDNT.	CONTROL VARIABLE IN VARIOUS DO-LOOPS. ALSO USED IN CALCULA- TION OF RANDOM NUMBER IN URAN31 AND AS A COUNTER IN SEPREC.	DO-LOOP MAXIMUM LIMIT (NUMBER OF DIFFERENT WIND SPEEDS USED IN SMOKE CALCULATION FOR THIS PASQUILL CATEGORY).	DO-LOOP CONTROL VARIABLE.	CONTROL VARIABLE FOR DO-LOOPS AND IMPLIED DO-LOOPS.	CONTROL VARIABLE FOR DO-LOOP.	CONTROL VARIABLE FOR IMPLICIT DO-LOOP.	CONTROL VARIABLE FOR VARIOUS DO-LOOPS AND IMPLICIT DO-LOOPS. ALSO USED IN CALCULATING INITIAL RANDOM NUMBER SEEDS.
UNITS		KM														
COMMON BLOCK	(F.P.) (LOCAL)	WEATHR	(LOCAL)	(LOCAL)	(LOCAL)	(LOCAL)	(L0CAL)	(LOCAL)	(LOCAL)	(LOCAL)	(LOCAL)	(LOCAL)	(LOCAL)	(LOCAL)	(LOCAL)	(LOCAL)
TYPE																
VARIABLE	IUNIT	IVL	IVLA	MI	IWTHRL	ΙX	XXXI	11	12	ŗ	JEND	JJ	JK	JKTEST	JL	¥

DEFINITION	NUMBER OF CHARACTERS IN KEYWORD OR OPTION WORD ABOUT TO BE	POSITION NUMBER OF CHARACTER OF OPTION WORD CURRENTLY BEING CHECKED TO OETERMINE WHETHER OPTION WORD IS A NUMERIC VALUE.	NUMBER OF CURRENT REPLICATION.	NUMBER OF THE ROUNO (SHOT) CURRENTLY BEING SIMULATED.	KTEST(I,J) IS THE NUMBER OF TIMES ABORT CONDITION I IS TESTED FOR ROUND (SHOT) NUMBER J. IF I < MSABLM, THEN KTEST(I,J)=O FOR J>1; IN SUCH CASES KTEŠT (I,1) IS THE NUMBER OF TIMES MISSION ABORT CONDITION I IS TESTED.	MAXIMUM LIMIT ON DO-LOOP COMPARING KTEST AND NTEST ARRAYS. (LIMU=1 IF COMPARING MISSION ABORT TESTS; LIMU=6 IF COMPARING ROUNO ABORT TESTS).	GIVES POSITION OF LAST COMMA ENCOUNTERED THUS FAR IN SEPARA- TING KEYWORDS AND OPTION WORDS OF CURRENT INPUT LINE.	USED IN CALCULATION OF INITIAL RANDOM NUMBER SEEDS.	MISSION ABORT LIMIT. CAUSE OF ABORT NUMBERS LESS THAN OR EQUAL TO MSABLM ARE MISSION ABORTS WHEREAS ABORT CAUSES NUMBEREO GREATER THAN MSABLM ARE ROUND ABORTS. A MISSION ABORT CANCELS ALL FURTHER STEPS IN THE POTENTIAL COPPERHEAD FIRE MISSION (REPLICATION) WHEREAS A ROUND ABORT MEANS ONLY THAT THE CURRENT ROUND IS UNSUCCESSFUL.	MAXIMUM DESIGNATOR-TO-TARGET RANGE AT WHICH OESIGNATOR OPERATOR WILL CALL FOR COPPERHEAO FIRE.	NUMBER OF CHARACTERS IN INPUT LINE WHOSE ITH CHARACTER IS CURRENTLY BEING CHECKED FOR SYMBOL CLASS.	NABORT(I,J) IS THE NUMBER OF TIMES TEST I WAS FAILED ON ROUND (SHOT) J. IF I< MSABLM, THEN NABORT(I,J)=0 FOR J>1; IN SUCH CASES NABORT(I,1) IS THE NUMBER OF TIMES MISSION ABORT TEST I WAS FAILEO.
O L L NII										METERS		
YOU B NOWWOO	(LOCAL)	(LOCAL)	RPLCTN	RPLCTN	KTEST	(LOCAL)	(LOCAL)	(LOCAL)	ABORT	RANGE	(F.P.)	ABORT
TVDE	1									REAL		
VADIABLE	KCHAR	KI	KREP	KRF	KTEST(20,6)	ГІМО	LSTCMA	Σ	MSABLM	MXDRNG	z	NABORT(20,6)

DEFINITION	NC(I) IS THE NUMBER INDICATING WHICH TYPE OF SYMBOL THE ITH CHARACTER OF THE CURRENT INPUT LINE IS. (0 INDICATES NUMERAL OR MINUS SIGN, 1 INDICATES LETTER OR APOSTROPHE, 2 INDICATES DECIMAL POINT, 3 INDICATES BLANK, 4 INDICATES SEPARATOR, 5 INDICATES A DOLLAR SIGN, AND 6 INDICATES ANY OTHER CHARACTER.)	SEQUENCE NUMBER OF CASE CURRENTLY BEING EXECUTED IN THIS PROGRAM RUN.	NUMBER OF DIFFERENT CLOUD CEILING ALTITUDE VALUES USED IN WEATHER DATA.	USED IN CREATING AND DECIPERING PEDATA RECORD NAME.	NCPR(I) IS THE NUMBER OF CHARACTERS IN THE ITH LINE OF THE B ARRAY (ITH FIELD ON INPUT LINE AFTER COMPRESSING MOST BLANKS AND POSSIBLY ADDING DECIMAL POINTS).	NCRD(I) IS THE NUMBER OF INPUT LINES READ FOR THE CURRENT CASE THAT DETERMINE THE OPTIONS USED WITH KEYWORD NUMBER I.	NUMBER OF RANGE POINTS USED IN DIRECT FIRE SUPPRESSION DISTRIBUTION (DFDOKL ARRAY).	NUMBER OF REPLICATIONS IN WHICH DESIGNATOR OPERATOR HAS BEEN KILLED FOR CURRENT CASE.	INDICATES NUMBER OF POINTS USED IN DEFINITION OF CUMULATIVE DISTRIBUTION FUNCTION NOW BEING SAMPLED.	MAXIMUM LIMIT ON DO-LOOP. (EQUALS NDR-1).	NUMBER OF POINTS USED IN DETECTION TIME DISTRIBUTION.	FIRST DIMENSION OF ARRAY WHOSE ELEMENTS DEFINE CUMULATIVE DISTRIBUTION BEING SAMPLED.	SECOND DIMENSION OF ARRAY WHOSE ELEMENTS DEFINE CUMULATIVE DISTRIBUTION BEING SAMPLED.	NKIL(I) IS THE NUMBER OF REPLICATIONS IN WHICH THE ITH ROUND OF THE FIRE MISSION KILLED A VEHICLE FOR THE CURRENT CASE.	NUMBER OF INPUT LINES READ SO FAR FOR THE CURRENT CASE.
UNITS															
COMMON BLOCK	(LOCAL)	RUNDAT	WEATHR	(LOCAL)	(LOCAL)	(LOCAL)	DODF	DODF	(F.P.)	(LOCAL)	RSPTIM	(F.P.)	(F.P.)	(L0CAL)	(LOCAL)
TYPE															
VARIABLE	NC(80)	NCASE	NCC	NCODE	NCPR(10)	NCRD(70)	NDFSP	NDOKIL	NDR	NDRM1	NDT	LON 1	ND2	NKILL(6)	NLRTC

DEFINITION	USED TO CONSTRUCT THE PEDATA RECORD NAME. NP(I) IS THE INDEX NUMBER (IN THE XVALUE ARRAY) OF THE CURRENT VALUE OF THE ITH PARAMETER OF THE PEDATA RECORD NAME.	NUMBER OF RANGE POINTS USED IN THE PROBABILITY OF LINE-OF-SIGHT FOR RANDOM OCCURRENCE (RNGPLS ARRAY).	NUMBER OF POINTS USED IN DEFINING CUMULATIVE DISTRIBUTIONS FOR LINE-OF-SIGHT SEGMENT LENGTHS.	NUMER OF KEYWORDS AND OPTION WORDS ENCOUNTERED ON CURRENT INPUT LINE.	NUMBER OF DIFFERENT KEYWORD CHARACTER STRINGS ALLOWED AS INPUTS.	NUMBER OF REPLICATIONS TO BE DONE FOR THE CURRENT CASE.	NUMBER OF ROUNDS (SHOTS) TO BE FIRED FOR EACH REPLICATION (POTENTIAL FIRE MISSION SAMPLE) FOR THIS CASE.	NUMBER OF ROWS TO BE READ INTO SEGLOS DISTRIBUTION.	NUMBER OF RANGE CLASSES INTO WHICH LINE-OF-SIGHT SEGMENT LENGTH DATA IS DIVIDED.	MAXIMUM LIMIT ON DO-LOOP. (EQUALS NRNGPS)	NUMBER OF RANGE POINTS FOR WHICH TARGET POSTURE DATA IS ENTERED IN RNGPST ARRAY.	NUMBER OF RANGE POINTS FOR WHICH "TRUE TARGET FACTOR" DATA IS ENTERED IN RNGTTF ARRAY.	NUMBER OF POINTS USED IN CUMULATIVE ACQUISITION RANGE DISTRIBUTION TABLE (CRNGD ARRAY).	ROW OF A ARRAY IN WHICH INTERPOLATION IS TO BE PERFORMED TO OBTAIN RANDOM VARIABLE VALUE IN SUBROUTINE SMPLCD.	NUMBER OF TYPE 1 SMOKE ROUNDS FIRED BY RED TO CREATE SMOKE SCREEN.	NUMBER OF TYPE 2 SMOKE ROUNDS FIRED BY RED TO CREATE SMOKE SCREEN.
UNITS															TYPE 1 SMOKE ROUNDS	TYPE 2 SMOKE ROUNDS
COMMON BLOCK	(LOCAL)	RANDOC	RNGLOS	(LOCAL)	ACHAR	RPLCTN	RPLCTN	(LOCAL)	RNGLOS	(LOCAL)	HIT	HIT	RNGLOS	(F.P.)	SMOKED	SMOKED
TYPE																
VARIABLE	(6) dN	NPLOSR	NPP	NRE	NREC	NREP	NRF	NRNGCB	NRNGCL	NRNGP1	NRNGPS	NRNGTT	NRP	NRS	NSMK2	NSMK5

VARIABLE	TYPE	COMMON BLOCK UNITS	
NTEST(20,6)		(LOCAL)	NTEST(I,J) IS THE NUMBER OF TIMES ABORT CONDITION I HAS BEEN TESTED FOR ROUND J FOR THIS CASE. FOR I MSABLM, NTEST(I,J)= NTEST(J,1) FOR J>1.
NTRC		COMENT	NUMBER OF "TRIPLE \$" COMMENTS READ AND WRITTEN WITH CURRENT CASE.
NUMRIC	LOGICAL	FUNCTION VALUE	TRUE, IF THE ITEM TESTED IS NUMERIC (CONTAINS ONLY NUMERALS, "-", AND "." AS SYMBOLS); FALSE, IF ITEM IS NOT NUMERIC.
NVEHCL		TARGET	NUMBER OF VEHICLES IN TARGET UNIT.
NVEHKL		RPLCTN	NUMBER OF VEHICLES KILLED BY COPPERHEAD THUS FAR IN CURRENT REPLICATION. (APPLIES ONLY TO RANDOM OCCURRENCE LINE-OF-SIGHT OPTION).
		WEATHR	NUMBER OF DIFFERENT METEOROLOGICAL VISIBILITY RANGE LIMITS USED WITH WEATHER DATA.
NXTLIN		(LOCAL)	COUNTER USED IN KEEPING TRACK OF LINE NUMBERS IN PRINTING OF CASE HEADING OUTPUT.
		(F.P.)	VARIABLE ARRAY DIMENSION.
		(F.P.)	VARIABLE ARRAY DIMENSION.
		(F.P.)	VARIABLE ARRAY DIMENSION.
0UT(6)		(LOCAL)	ARRAY USED TO STORE ITEMS ABOUT TO BE WRITTEN ON THE PRINTOUT.
PAREN	LOGICAL	(F.P.)	FLAG TO INDICATE WHETHER A RIGHT PARENTHESIS IS TO BE INCLUDED IN FORMATTING A PERCENTAGE. (TRUE INDICATES PARENTHESIS IS TO BE INCLUDED; FALSE INDICATES IT IS NOT).
PASPCT(20,6)		(L0CAL)	PASPCT(I,J) IS THE PERCENTAGE OF REPLICATIONS TESTED AT ABORT CONDITION I THAT PASSED (DID NOT ABORT) FOR ROUND J. (IF I< MSABLM, PASPCT(I,J) = PASPCT(I,I) FOR J>1; IF NTEST(I,J)=0, PASPCT(I,J) IS SET TO -1).
PASQL (6)		WEATHR	PASQL(I) IS THE PROBABILITY OF OCCURRENCE OF PASQUILL ATMOSPHERIC STABILITY CATEGORY I FOR THE CURRENT CASE'S WEATHER CONDITIONS.
PASQT		(LOCAL)	THE PASQL VALUES ARE GROUPED IN PAIRS. PASQT IS THE SUM OF PASQL(2*I-1) AND PASQL(2*I) FOR THE CURRENT VALUE OF I.

DEFINITION	PB(I,J) IS THE ITH CHARACTER OF THE JTH KEYWORD OR OPTION WORD OF THE CURRENT INPUT LINE.	PROBABILLIY THAT THE DESIGNATOR-TO-FDC CALL-FOR-FIRE MESSAGE CONTAINS THE CORRECT FIRE MISSION INFORMATION AND IS CORRECTLY INTERPRETED.	PROBABILITY THAT DESIGNATOR OPERATOR IS KILLED BY DIRECT FIRE FROM TARGET VEHICLE.	PROBABILITY THAT DESIGNATOR OPERATOR IS SUPPRESSED DUE TO OBSCURANTS CREATED BY NEAR MISSES CAUSED BY DIRECT FIRE FROM TARGET VEHICLE.	PROBABILITY THAT DUST FROM HE ARTILLERY FIRE IS SUFFICIENT TO OBSCURE TARGET AND PREVENT USE OF COPPERHEAD.	PROBABILITY THAT ROUND ENGAGES TARGET (I.E., SUFFICIENT REFLECTED LASER ENERGY IS PICKED UP BY THE SEEKER AND THE TARGET IS WITHIN THE MANEUVER FOOTPRINT OF THE COPPERHEAD ROUND).	USED TO DECIPHER PEDATA RECORD NAME FOR CASE HEADING OUTPUT.	RECORD NAME KEY FOR PROBABILITY OF ENGAGEMENT DATA RECORD ON WORD ADDRESSABLE MASS STORAGE FILE (TAPE 11).	ARRAY TO WHICH THE ELEMENTS OF THE PROBABILITY OF ENGAGEMENT (PE) DATA BLOCK ARE EQUIVALENCED.	PETBL(I,J,K) IS THE PROBABILITY THAT THE COPPERHEAD ROUND ENGAGES THE TARGET GIVEN INDEX VALUE I, VISIBILITY RANGE LIMIT J, AND DESIGNATOR TARGET RANGE K.	PROBABILITY OF ENGAGEMENT VALUE FOR TIME 1 AND RANGE 1 WHEN INTERPOLATING IN PROBABILITY OF ENGAGEMENT DATA WITH IMUTS=1	SAME AS PETIRI BUT FOR TIME I AND RANGE 2.	SAME AS PETIRI BUT FOR TIME 2 AND RANGE 1.	SAME AS PETIRI BUT FOR TIME 2 AND RANGE 2.	LOWER RANGE PROBABILITY OF ENGAGEMENT VALUE WHEN INTERPOLA- TING WITH RESPECT TO RANGE IN PROBABILITY OF ENGAGEMENT DATA WITH IMUTS=2.
UNITS															
COMMON BLOCK	(LOCAL)	RSPIIM	(LOCAL)	(LOCAL)	MISC	(LOCAL)	(LOCAL)	RECNAM	(LOCAL)	HIT	(LOCAL)	(LOCAL)	(LOCAL)	(LOCAL)	(LOCAL)
TYPE															
VARIABLE	PB(80,10)	P CRMSG	PDOKIL	PDOSUP	PDSTKL	PE	PECHK	PECODE	PEDATA(4260)	PETBL(60,10,7)	PETIRI	PET1R2	PET2R1	PET2R2	PEI

DEFINITION	UPPER RANGE PROBABILITY OF ENGAGEMENT VALUE WHEN INTERPOLA- TING WITH RESPECT TO RANGE IN PROBABILITY OF ENGAGEMENT DATA WITH IMUTS=2.	PROBABILITY ROUND HITS TARGET GIVEN THAT ROUND ENGAGES.	PROBABILITY ROUND KILLS TARGET VEHICLE GIVEN THAT ROUND HITS TARGET VEHICLE.	PKTBL(I,J) IS THE PROBABILITY OF KILL GIVEN A HIT FOR COPPERHEAD AGAINST TARGET TYPE I IN TARGET POSTURE J.	USED TO BRACKET UNIFORM RANDOM NUMBER IN A WEATHER CLASS PROBABILITY TABLE.	PROBABILITY OF ATTEMPTED ENGAGEMENT GIVEN AN OCCASION.	PROBABILITY OF KILL GIVEN AN ATTEMPTED ENGAGEMENT.	PROBABILITY OF KILL GIVEN AN OCCASION.	PROBABILITY OF KILL GIVEN A SHOT.	PRBLOS(I) IS THE PROBABILITY THAT A SINGLE VEHICLE LOCATED AT RANDOM ALONG AN APPROACH PATH IN RANGE BRACKET I WILL BE WITH IN THE DESIGNATOR OPERATOR'S LINE-OF-SIGHT FOR AT LEAST THE CRITICAL TIME (TCRIT SECONDS).	PROBABILITY OF SHOT GIVEN AN ATTEMPTED ENGAGEMENT.	PROBABILITY OF SHOT GIVEN AN OCCASION.	PRCFLS(I) IS THE PROBABILITY OF CLOUD FREE LINE-OF-SIGHT GIVEN CONDITION I. (I=1 INDICATES A CLOUD CEILING; I=2 INDICATES SCATTERED CLOUDS ONLY).	PROBABILITY THAT THERE IS A CLOUD CEILING.	PROBABILITY DESIGNATOR KILLED BY DIRECT FIRE GIVEN THAT DIRECT FIRE OCCURRED.	PROBABILITY DESIGNATOR KILLED GIVEN AN OCCASION	PROBABILITY THAT THE DESIGNATOR-OPERATOR IS WARNED TO BEGIN LASING IN TIME TO GUIDE THE FIRST ROUND OF THE FIRE MISSION TO THE TARGET.
UNITS																	
COMMON BLOCK	(LOCAL)	(LOCAL)	(LOCAL)	HIT	(LOCAL)	(LOCAL)	(LOCAL)	(LOCAL)	(LOCAL)	RANDOC	(LOCAL)	(LOCAL)	WEATHR	WEATHR	(LOCAL)	(LOCAL)	RSPTIM
TYPE																	
VARIABLE	PE2	ЬН	PK	PKTBL(10,2)	PR	PRBAE0	PRBKAE	PRBKO	PRBKS	PRBL0S(10)	PRBSAE	PRBSO	PRCFLS(2)	PRCLCG	PRDOKC	PRDOKL	PRDOW

	DEFINITION	PRGCFL(I,J) IS THE PROBABILITY OF METEOROLOGICAL VISIBILITY RANGE LIMIT I GIVEN CLOUD FREE LINE-OF-SIGHT AND CONDITION J (J=1 INDICATES CLOUD CEILING; J=2 INDICATES SCATTERED CLOUDS)	PRHLOS(I) IS THE PROBABILITY THE LINE-OF-SIGHT EXISTS FROM DESIGNATOR TO TARGET FOR ROUND I. (I.E., LOS EXISTS BOTH BEFORE FIRING AND DURING TERMINAL PHASE OF TRAJECTORY).	PROBABILITY THAT AT LEAST ONE TARGET IS IN VIEW FOR THE CRITICAL TIME (TCRIT SECONDS) DURING THE TERMINAL PHASE OF THE COPPERHEAD TRAJECTORY.	PROBABILITY OF LINE-OF-SIGHT TO A SINGLE TARGET FOR THE CRITICAL TIME DURATION (TCRIT SECONDS) DURING THE TERMINAL PHASE OF THE COPPERHEAD TRAJECTORY.	PROBABILITY THAT DESIGNATOR TO FDC DIGITAL COMMUNICATION LINK IS OPERATING SUCCESSFULLY.	PARAMETERIZED RESPONSE TIME.	PROBABILITY THAT DESIGNATOR TO FDC VOICE COMMUNICATION IS SUCCESSFUL.	USED TO BRACKET RANDOM NUMBER IN A WEATHER CLASS PROBABILITY TABLE.	NAME RECORD KEY FOR TARGET POSTURE DATA RECORD ON WORD ADDRESSABLE RANDOM ACCESS MASS STORAGE FILE (TAPE 11).	PROBABILITY THAT SMOKE ABORTS POTENTIAL COPPERHEAD FIRE MISSION.	ARRAY TO WHICH THE ELEMENTS OF THE TARGET POSTURE DISTRIBUTION DATA BLOCK ARE EQUIVALENCED.	PSTTBL(I,J) IS THE PROBABILITY THAT A MOVING TARGET AT RANGE I IS IN POSTURE J (WHERE J=1 INDICATES A COMPLETELY OBSCURED TARGET, J=2 INDICATES A FULLY EXPOSED TARGET, AND J=3 INDICATES A HULL DEFILADE TARGET).	PSTVAL(I) IS THE PROBABILITY THAT THE TARGET IS IN POSTURE I WHERE I=1,2 AND 3 RESPECTIVELY INDICATE THAT THE TARGET IS COMPLETELY OBSCURED, FULLY EXPOSED, AND HULL DEFILADE.	GAMMA RANDOM DEVIATE.
aroson	UNITS						SECONDS								
	COMMON BLOCK	WEATHR	(LOCAL)	(L0CAL)	(LOCAL)	RSPTIM	RSPTIM	RSPTIM	(LOCAL)	RECNAM	SMOKED	(LOCAL)	HIT	(LOCAL)	(LOCAL)
	TYPE														
	VARIABLE	PRGCFL(11,2)	PRHLOS(6)	PRIV	PRL0S	PRSDT	PRSPTM	PRSVT	PR1	PSCODE	PSMKKL	PSTDAT(41)	PSTTBL(10,3)	PSTVAL(3)	R(1)

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VARIABLE	TYPE	COMMON BLOCK	UNITS	DEFINITION
RECLBL(8)		DISPLY		RECLBL(I) IS AN ALPHANUMERIC CODE THAT FORMS PART OF THE RECORD NAME KEY FOR WORO AOORESSABLE MASS STORAGE FILE (TAPE 11) RECORDS OF TYPE I. (WHICH CORRESPOND TO KEYWORD 20+I).
REFL		PEDESC (F.P.)		REFLECTIVITY OF TARGET TO LASER ENERGY IN DESIGNATOR WAVE LENGTH.
RELIF		MISC		ROUND IN FLIGHT RELIABILITY. PROBABILITY THAT ROUND FUNCTIONS CORRECTLY.
RN		(LOCAL)		UNIFORMLY OISTRIBUTED RANDOM NUMBER.
RNDREC(6)		sccss		RNDREC(I) IS THE NUMBER OF TARGETS KILLED FOR THE CURRENT CASE BY THE ITH ROUND. (RNDREC(I) = NKILL(I).)
RNGCLB(11)		RNGLOS	METERS	RNGCLB(I) IS THE UPPER BOUNDARY OF THE ITH RANGE CLASS FOR LINE-OF-SIGHT SEGMENT LENGTHS.
RNGK		(LOCAL)	KM	RNGK IS THE CURRENT DESIGNATOR-TO-TARGET RANGE IN KILOMETERS
RNGNOW		(LOCAL)	METERS	CURRENT DESIGNATOR-TO-TARGET RANGE IN METERS.
RNGPLS(10)		RANDOC	METERS	RNGLOS(I) IS THE UPPER BOUNDARY OF THE ITH RANGE CLASS OF PRBLOS ARRAY.
RNGPST(10)		HIT	METERS	RNGPST(I) IS THE DESIGNATOR-TO-TARGET RANGE FOR THE ITH POSTURE BREAKDOWN DISTRIBUTION IN THE PSTTBL ARRAY.
RNGTTF(20)		HIT	METERS	RNGTTF(I) IS THE DESIGNATOR-TO-TARGET RANGE FOR THE ITH SET OF "TRUE TARGET FACTORS" IN THE TTF ARRAY.
RN1, RN2, RN22		(LOCAL)		THE RANOOM NUMBERS RESULTING FROM CALLS OF URAN31 (I.E., RNi=URAN31 (IRi)) SOME OF THE RN'S (RN9 FOR EXAMPLE) ARE NO LONGER PRESENT IN THE PROGRAM).
ROCODE		RECNAM		RECORD NAME KEY FOR RANDOM OCCURRENCE DATA RECORD ON WORD AOORESSABLE MASS STORAGE FILE (TAPE 11).
RODATA(22)		(LOCAL)		ARRAY TO WHICH THE ELEMENTS OF THE RANDOM OCCURRENCE DATA BLOCK ARE EQUIVALENCED.
ROLBL(4,2)		HEADNG		ARRAY OF ALPHANUMERIC CONSTANTS USED TO CREATE LABELING OF LOS MODE SECTION OF OUTPUT.
RSCODE		RECNAM		RECORD NAME KEY FOR RESPONSE TIME DATA RECORD ON WORD ADDRESSABLE MASS STORAGE FILE (TAPE 11).

ARRAY TO WHICH THE ELEMENTS OF THE RESPONSE TIME DATA BLOCK	ARE EQUIVALENCED.	ARRAY OF ALPHANUMERIC CONSTANTS USED TO CREATE LABELING OF RESPONSE TIME SECTION OF OUTPUT.	RANGE FROM TARGET UNMASK TO FOOTPRINT CENTROID.	LENGTH OF LINE-OF-SIGHT SEGMENT DRAWN FOR THE CURRENT REPLICATION.	SEGLOS(I,J) FOR J=1 IS THE ITH PROBABILITY VALUE USED FOR BRACKETING A UNIFORM RANDOM NUMBER WHEN INTERPOLATING IN CUMULATIVE LOS SEGMENT LENGTH DISTRIBUTION. SEGLOS(I,J) FOR J>1 IS THE ITH LINE-OF-SIGHT SEGMENT LENGTH VALUE USED FOR INTERPOLATING IN RANGE CLASS J-1. (SEGLOS(I,I) IS THE PROBABILITY THAT A LINE-OF-SIGHT SEGMENT IN RANGE CLASS J-1 IS LESS THAN OR EQUAL TO SEGLOS(I,J)).	AN ARRAY OF ALPHANUMERIC SYMBOLS THAT CAN BE USED AS KEYWORD OR OPTION WORD SEPARATORS (",","(",")", "/", "?") THEY ARE STORED IN A1 FORMAT.	FLAG TO INDICATE WHETHER SEQUENCE NUMBERS (FROM CDC EDITOR) ARE PRESENT IN COLUMNS 73-78 OF INPUT FILE. (TRUE INDICATES SEQUENCE NUMBERS; FALSE INDICATES NO SEQUENCE NUMBERS).	FLAG TO INDICATE WHETHER SHORT OR LONG FORM OF SUBROUTINE ECHO'S OUTPUT IS TO BE USED. (SHRTEC=TRUE FOR SHORT FORM; SHRTEC=FALSE FOR LONG FORM).	COPPERHEAD SEEKER SENSITIVITY.	FLAG TO INDICATE WHETHER A COMMENT IS A PROGRAM GENERATED "TRIPLE \$" COMMENT. (IF TRUE, IT IS; IF FALSE, IT IS NOT).	VERSION NUMBER OF PROGRAM (INCREASED AS PROGRAM IS MODIFIED)	SMK2(I,J,K) IS THE NUMBER OF TYPE 1 SMOKE ROUNDS REQUIRED TO CREATE A SMOKE SCREEN FOR 30 MINUTES ACROSS 1 KILOMETER OF FRONT SUFFICIENT TO PREVENT THE USE OF COPPERHEAD AGAINST TARGETS IN THE SMOKED AREA GIVEN PASQUILL ATMOSPHERIC STABILITY CATEGORY 2*I OR 2*I-1, WIND SPEED J, AND RELATIVE HUMIDITY K.
UNITS			METERS	METERS	NONE, METERS				JOULES/M ²			TYPE 1 SMK ROUNDS
COMMON BLOCK	,	HEADNG	RSPTIM	(LOCAL)	RNGLOS	SYMBOL	L0GFLG	LOGFLG	PEDESC F.P.	т Ф.	STITLE	SMOKED
TYPE							LOGICAL	LOGICAL		LOGICAL		
VARIABLE RSPDAT (49)		RSPLBL(3,3)	RUMC	SEGLNG	SEGLOS(11,11)	SEP(5)	SEQNML	SHRTEC	SKSEN	SLCOM3	SLVERS	SMK2(3,3,2)

DEFINITION	SAME AS SMK2 EXCEPT FOR TYPE 2 SMOKE ROUND.	SPCL(I) IS TRUE IF A SPECIAL OPTION IS IN EFFECT FOR KEYWORD I; FALSE IF SPECIAL OPTION NOT IN EFFECT.	TIME BETWEEN SUCCESSIVE ROUNDS FIRED ON A SINGLE REPLICATION.	CRITICAL TIME. LENGTH OF TIME INTERVAL AT TERMINAL PHASE OF TRAJECTORY DURING WHICH COPPERHEAD SEEKER MUST BE TRACKING A SPOT DESIGNATED ON (OR NEAR) THE TARGET.	FACTOR USED FOR INTERPOLATING WITH RESPECT TO RANGE IN PROBABILITY OF ENGAGEMENT TABLES WHEN IMUTS=2.	WEIGHTING FACTOR USED FOR INTERPOLATING WITH RESPECT TO RANGE IN TARGET POSTURE DISTRIBUTION TABLE.	WEIGHTING FACTOR USED FOR INTERPOLATING WITH RESPECT TO RANGE IN "TRUE TARGET FACTOR" TABLE.	WEIGHT FACTOR APPLIED FOR SHORTER RANGE WHEN INTERPOLATING WITH RESPECT TO RANGE IN PROBABILITY OF ENGAGEMENT TABLES WITH IMUTS=1.	WEIGHT FACTOR APPLIED FOR LONGER RANGE WHEN INTERPOLATING WHEN RESPECT TO RANGE IN PROBABILITY OF ENGAGEMENT TABLES WITH IMUTS=1.	ANGLE BETWEEN FOOTPRINT CENTROID-TO-GUN LINE AND TARGET DIRECTION OF TRAVEL.	ALPHANUMERIC DISPLAY OF TIME AT WHICH PROGRAM WAS RUN (OBTAINED FROM COMPUTER'S INTERNAL CLOCK).	CURRENT TIME IN SECONDS SINCE TARGET UNMASKED FROM TERRAIN.	TIME AT WHICH ROUND CURRENTLY BEING CONSIDERED WILL ARRIVE (IMPACT).	TIME AT WHICH FIRST ROUND OF THIS REPLICATION WILL ARRIVE (IMPACT).
UNITS	TYPE 2 SMK ROUNDS		SECONDS	SECONDS						DEGREES		SECONDS	SECONDS	SECONDS
COMMON BLOCK	SMOKED	LOGFLG	TIME	RANDOC	(LOCAL)	(LOCAL)	(LOCAL)	(LOCAL)	(LOCAL)	PEDESC (F.P.)	RUNDAT	TIME	TIME	TIME
TYPE		LOGICAL												
VARIABLE	SMK5(3,3,2)	SPCL(70)	TBR	TCRIT	¥	TFRAC	TFRAC1	TF1	1F2	ТСТНО	TIM	TIMNOM	TIMRA	T IMRA 1

			GLUSSAK	GLUSSANKY = CUMITINDED
VARIABLE	TYPE	CONMONELOCK	UNITS	DEFINITION
TMEAN(2,2)		RSPTIM	SECONDS	TMEAN(I,J) IS THE MEAN TIME REQUIRED TO ENTER COPPERHEAD FIRE MISSION REQUEST IN DIGITAL MESSAGE DEVICE FOR CONDITION I, J. (I=1 INDICATES DAY, I=2 INDICATES NIGHT, J=1 INDICATES PRE-PLANNED TARGET, J=2 INDICATES TARGET OF OPPORTUNITY).
TMPLBL(8)		DISPLY		ALPHANUMERIC CONSTANTS USED TO LABEL OUTPUT HEADINGS WHEN TEMPORARY OR OVERRIDE OPTION IS USED.
T0F		TIME	SECONDS	TIME OF FLIGHT FOR COPPERHEAD ROUND (TIME FROM FIRING UNTIL IMPACT).
TOFARY(16)		FLTTIM	SECONDS	TOFARY(I) IS THE TIME OF FLIGHT OF COPPERHEAD ROUND (USING PREFERRED ELEVATION AND CHARGE) FOR GUN-TO-TARGET RANGE OF I KILOMETERS.
TR		(LOCAL)	SECONDS	NOMINAL DESIGNATOR-FDC-BATTERY RESPONSE TIME.
TRARRY(3,2)		RSPTIM	SECONDS	TRARRY(I,J) IS THE NOMINAL DESIGNATOR-FDC-BATTERY RESPONSE TIME FOR MISSION TYPE J. (I=1 INDICATES PRE-PLANNED TARGET, I=2 INDICATES TARGET OF OPPORTUNITY, I=3 INDICATES PRIORITY PRE-PLANNED TARGET, J=1 INDICATES DIGITAL COMMUNICATION, J=2 INDICATES VOICE COMMUNICATION).
TRBAR		RSPTIM	SECONDS	NOMINAL DESIGNATOR-FDC-BATTCRY RESPONE TIME PLUS TIME OF FLIGHT.
TRBAR1		(LOCAL)	SECONDS	SAME AS TRBAR.
TSIGMA(2,2)		RSPTIM	SECONDS	TSIGMA(I,J) IS THE STANDARD DEVIATION OF THE DISTRIBUTION OF TIME REQUIRED TO ENTER COPPERHEAD FIRE MISSION REQUEST IN DIGITAL MESSAGE DEVICE FOR CONDITION I,J. (I,J HAVE SAME MEANING AS FOR THE VARIABLE TMEAN).
TTF(3,20,2)		HIT		TTF(I,J,K) IS THE PROBABILITY COPPERHEAD HITS THE TARGET GIVEN SEEKER ENGAGEMENT WITH DESIGNATOR TYPE I, RANGE J, AND TARGET POSTURE K. (I=1,2,3 INDICATE DESIGNATOR TYPES 1,2,3 RESPECTIVELY; J INDICATES JTH RANGE OF RNGTTF ARRAY; K=1 INDICATES FULLY EXPOSED TARGET, K=2 INDICATES HULL DEFILADE TARGET).
TVEL		TARGET	METERS/ SECONDS	TARGET SPEED.

	R MULTIPLE NE TIME	OR ACTUAL PONSE	R O, TARGET				PRINT			IN THE		ICATIONS; IONS.		-PLANNED) TARGET.		\ATOR	INDICATES
DEFINITION	FIRST TIME DELAY COMPONENT OF DELTAT. (ACCOUNTS FOR MULTIPLE VEHICLES AND MULTIPLE ROUNDS). ALSO, NOMINAL RESPONE TIME VALUE FOR PRINTING IN COMMENT.	SECOND TIME DELAY COMPONENT OF DELTAT. (ACCOUNTS FOR ACTUAL RESPONE TIME AND DETECTION TIME VERSUS NOMINAL RESPONSE TIME).	THIRD TIME DELAY COMPONENT OF OELTAT. (ACCOUNTS FOR POSITIONING OF FOOTPRINT WHEN RUMC IS PLAYED). ALSO, TARGET SPEED VALUE FOR PRINTING IN COMMENT.	GUN-TO-TARGET RANGE VALUE FOR PRINTING IN COMMENT.	TARGET REFLECTIVITY VALUE FOR PRINTING IN COMMENT.	ANGLE T VALUE FOR PRINTING IM COMMENT.	DEFLECTION BIAS (POINT OF CLOSEST APPROACH TO FOOTPRINT CENTROID) VALUE FOR PRINTING IN COMMENT.	TARGET HEADING VALUE FOR PRINTING IN COMMENT.	SEEKER SENSITIVITY VALUE FOR PRINTING IN COMMENT.	U(I) IS A VALUE ASSOCIATEO WITH KEYWORD I AND USED IN THE CURRENT CASE (EQUIVALENT TO UVALUE).	NO LONGER USED.	UIDIGT=1.0 INDICATES DIGITAL DESIGNATOR-FDC COMMUNICATIONS; UIDIGT=2 INDICATES VOICE DESIGNATOR-FDC COMMUNICATIONS.	UIDN=1 INDICATES DAY; UIDN=2 INDICATES NIGHT.	USED MISSION CODE. UMC=1,2,3 MEAN RESPECTIVELY PRE-PLANNED TARGET, TARGET OF OPPORTUNITY, PRIORITY PRE-PLANNED TARGET.	USED PARAMETERIZED RESPONSE TIME.	URAN31 IS THE UNIFORM (PSEUDO-) RANDOM NUMBER GENERATOR USED IN THIS PROGRAM.	USERC=TRUE INDICATES A USER'S COMMENT; USERC=FALSE INDICATES A PROGRAM GENERATED COMMENT.
	FIR VEH VAL	SECOND RESPON TIME).		GUN	TAR	ANGI	DEF! CEN	TAR		U(I) CURF	NO I	UID UID	UID	USED TARC	USED	URAN USED	USER A PR
UNITS	SECONDS	SECONOS	SECONDS, M/S	ΜX		DEGREES	METERS	DEGREES	JOULES/M ²						SECONOS		
COMMON BLOCK	(LOCAL)	(LOCAL)	(LOCAL)	(LOCAL)	(LOCAL)	(LOCAL)	(LOCAL)	(LOCAL)	(LOCAL)	UVALUE	UVALUE	UVALUE	UVALUE	UVALUE	UVALUE	FUNCTION VALUE	Р. Р.
TYPE																	LOGICAL
VARIABLE	E	12	೯	T4	T5	T6	17	T8	19	u(70)	UDT	UIDIGT	NDIN	UMC	UPRT	URAN31	USERC

VARIABLE	TYPE	COMMON BLOCK	UNITS	DEFINITION
USMK(2)		UVALUE		USMK(1) IS THE NUMBER OF TYPE 1 SMOKE ROUNDS USED. USMK(2) IS THE NUMBER OF TYPE 2 SMOKE ROUNDS USED.
UVALUE(70)				EQUIVALENT TO U ARRAY.
VEL		F.P.	METERS/ SECONDS	TARGET SPEED.
VELTBL(2,2)		RNGLOS	METERS/ SECONDS	VELTBL(I,J) IS TARGET SPEED IN CONDITIONS I,J. (I=1 FOR DAY, I=2 FOR NIGHT, J=1 FOR SUMMER, J=2 FOR WINTER).
VERDAT(2)		STITLE		DATE (ALPHANUMERIC CONSTANT) OF LAST CHANGE TO CURRENT PROGRAM.
VIS(11)		WEATHR	Μ	VIS(I) IS THE ITH METEOROLOGICAL VISIBILITY RANGE LIMIT VALUE USED IN THE WEATHER DATA.
VISLIM		RANGE	ΚM	THE METEOROLOGICAL VISIBILITY RANGE LIMIT VALUE FOR THE CURRENT REPLICATION.
VSMK		(LOCAL)	χ	LENGTH OF FRONT THAT CAN BE SMOKED WITH GIVEN NUMBER OF ROUNDS AND GIVEN WEATHER CONDITIONS. INTERMEDIATE VARIABLE IN CALCULATION OF PSMKKL.
W(6,11,2)		WEATHR		W(I,J,K) IS THE PROBABILITY (GIVEN A CLOUD CEILING) OF HAVING WEATHER WITH CLOUD CEILING ALTITUDE I, METEOROLOGICAL VISIBILITY RANGE LIMIT J, AND CLOUD FREE LOS CONDITION K (K=1 INDICATES CLOUD FREE LOS; K=2 INDICATES NO CLOUD FREE LOS).
WCFSUM(2)		WEATHR		SCFSUM(I) IS THE SUM OF ELEMENTS PRGCFL(1,I) THROUGH PRGCFL (NVL,I). (USED TO NORMALIZE RANDOM NUMBERS BEFORE SAMPLING FROM PRGCFL ARRAY).
WCODE		RECNAM		RECORD NAME KEY FOR WEATHER DATA RECORD ON WORD ADDRESSABLE MASS STORAGE FILE (TAPE 11).
WDATA(193)		(LOCAL)		ARRAY TO WHICH THE ELEMENTS OF THE WEATHER DATA BLOCK ARE EQUIVALENCED.
WK(6)		LOCAL		WORKING AREA ARRAY USED BY IMSL ROUTINE GGAMA.
WNDSPD(3,3)		WEATHR		WNDSPD(I,J) IS THE PROBABILITY OF HAVING JTH WINDSPEED GIVEN PASQUILL ATMOSPHERIC STABILITY CATEGORY 2*I OR 2*I-1.

DEFINITION	WSUM(I) IS THE SUM OF ELEMENTS W(1,1,1) THROUGH W(6,11,1). (USED TO NORMALIZE RANDOM NUMBERS BEFORE SAMPLING FROM W ARRAY).	USED AS INTERMEDIATE VARIABLE FOR CALLING FPRCNT.	PERCENTAGE VALUE SENT TO FPRCNT FUNCTION FOR FORMATTING.	XMTTIM(I,J) IS THE TIME REQUIRED TO TRANSMIT THE REQUEST FOR COPPERHEAD FIRE FROM DESIGNATOR OPERATOR TO FDC USING COMMUNICATION MODE I FOR A MISSION TYPE J. (I=1 FOR DIGITAL COMMUNICATION, I=2 FOR VOICE; J=1 FOR PRE-PLANNED TARGET, J=2 FOR TARGET OF OPPORTUNITY).	XMVADF(I) IS THE TIME REQUIRED TO TRANSMIT REQUEST FOR COPPERHEAD FIRE FROM DESIGNATOR OPERATOR TO FDC VIA VOICE AFTER TRYING DIGITAL (AND FAILING DIGITAL) FOR MISSION TYPE I. (I=1 FOR PRE-PLANNED TARGET, I=2 FOR TARGET OF OPPORTUNITY.)	NUMBER OF CURRENTLY UNKILLED VEHICLES IN TARGET.	NAME OF VALUES OUTPUT AFTER SPECIAL FORMATTING.	RANDOM SAMPLE VALUE RETURNED BY SUBROUTINE SMPLCD.	XVALUE(I,J,1) IS THE ITH ALLOWABLE VALUE FOR THE JTH PARA- METER USED TO CONSTRUCT (OR DECIPHER) THE PEDATA RECORD NAME. XVALUE(I,J,2) IS THE CODE NUMBER CORRESPONDING TO XVALUE (I,J,1). (NOTE THAT NOT ALL POSSIBLE I,J COMBINATIONS NEED CORRESPOND TO VALUES ACTUALLY ALLOWED IN CURRENT CASES.)	ALPHANUMERIC ABBREVIATION FOR NAME OF MONTH WHOSE WEATHER DATA IS BEING USED.	INTERMEDIATE VARIABLE NAME USED IN CALL TO FPRCNT.	REFORMATTED PERCENTAGE VALUES.	ALPHANUMERIC TIME OF DAY VALUE FOR WEATHER DATA.	REFORMATTED PERCENTAGE VALUES.
UNITS				SECONDS	SECONDS									
COMMON BLOCK	WEATHR	(LOCAL)	(F.P.)	RSPTIM	RSPTIM	(LOCAL)	(LOCAL)	(F.P.)	XVALUE	(LOCAL)	(LOCAL)	(LOCAL)	(LOCAL)	(LOCAL)
TYPE														
VARIABLE	WSUM(2)	×	XIN	XMTTIM(2,2)	XMVADF (2)	XNX	XOUT	XSMPL	XVALUE(8,9,2)	XWTHR	>-	YOUT	TWTHR	ZOUT

CHAPTER 13

13. CONVERSION TO OTHER COMPUTERS

The COPE model and its preprocessors were written for use on the US Army Ballistic Research Laboratories Control Data Corporation CYBER 76 (CDC 7600) computer. These programs use some of the features that are peculiar to CDC machines. This chapter points out some of the changes to COPE and its preprocessors that will be required to convert them to run on other machines.

13.1 Conversion To Other CDC Computers.

COPE and its preprocessors have been run on other CDC machines (a CDC 6600 at Aberdeen Proving Ground and a CDC 6400 and a CDC 6500 at FT Leavenworth, KS).

Two changes were required. The first was to change the Hollerith string delimiters from '(single quote) to whatever the host machine uses to delimit Hollerith strings (" double quote on the FT Leavenworth machine, \neq on machines using CDC's standard, * at some other installations). This includes strings on STOP statements.

The second change was to define the cotangent function in PAM. The BRL CDC machines have the cotangent (COT) function as a library function; some other machines do not. This can be easily fixed by defining COT(X) = 1./TAN(X) as an in-line or statement function in PAM. Of course an alternate fix is to replace each occurrence of COT(X) by (1./TAN(X)).

Once these changes were made, the COPE program and its preprocessors ran without any trouble on the other CDC machines.

13.2 Conversion To Non-CDC Computers.

The author cannot anticipate every problem the user may encounter in converting COPE and its preprocessors to run on other machines; however, there are certain changes that will have to be made and of which the author is aware. The only machine (other than the CDC machines) that the author uses to any significant extent is the UNIVAC 1108, so most of the comments in this section deal with changes the author knows will have to be made to get the programs working on the UNIVAC machines.

13.2.1 Hollerith Delimiters and STOP's. The first change that may be required is to change the Hollerith string delimiters from ' to whatever is used on the host machine.

The CDC machines allow a STOP statement with a message (the message is in Hollerith string delimiters itself) which is printed when that STOP is encountered. Other machines may allow only a number with the stop, only a shorter message (CDC allows up to 70 characters; UNIVAC allows 6 characters), or nothing at all. So depending on the STOP

messages allowed, all of the STOP statements in COPE and its preprocessors may require changes.

13.2.2 A FORMATS and Alphanumeric Arrays. The CDC machines use a 60 bit word and a six bit character code so that each word holds 10 characters. Hence, most of the alphanumeric reads, writes, encodes, and decodes use AlO format and most data statements use 10H format to set alphanumeric values.

For machines that use shorter words or 8 bit character codes, the number of characters per word will probably be fewer. This means that the AlO formats in COPE and its preprocessors (and, indeed, all An formats where n> number of characters per word on the host machine) must be changed. A similar remark applies to all 10H (or nH with n as above) formats in data statements. Reducing these formats to the limits of the host machine will sometimes require that arrays containing the alphanumeric data be redimensioned. For example, the B array in subroutine INPUT is currently dimensioned B(8,10); if used on the UNIVAC 1108 which has 6 characters per word, it would have to be redimensioned B(14,10) so that each row could still contain a full card image (80 characters).

13.2.3 Word Addressable Mass Storage Files. The CDC system subroutines to open, read from, write to, and close a word addressable mass storage file are respectively OPENMS, READMS, WRITMS, and CLOSMS. The array INDEX11, the system subroutine SYSTEMC, and the user routines NOREC and NOREC2 are also connected with COPE's use of word addressable files.

The most convenient way to adapt COPE's handling of these files to the host machine is probably to write subroutines OPENMS, READMS, WRITMS, and CLOSMS that use the host machine's equivalent file type and commands, and which perform the same operations as on CDC.

In the specific case of the UNIVAC, for example, OPENMS would be a subroutine which first does a DEFINE FILE, then reads from the direct access file (using UNIVAC terminology -- this is equivalent to the CDC word addressable file) the current values of the INDX11 array. Subroutine READMS would search the INDX11 array for the desired record name and then when the name was found and the corresponding address v looked up, it would do a READ (11'v); if the record name were not found, NOREC would be called (or NOREC2 in PREPMS). Subroutine WRITMS would add a record name and address to INDX11 (or perhaps just modify the addresses if the record name were already present) and the do a WRITE (11'v). CLOSMS would do a WRITE (11'v) of INDX11 to TAPE11.

Non-CDC machines may also require redimensioning of INDX11 to allow record names to take up two (or more) words of characters. Also additional bookkeeping of record addresses may be required in PREPMS.

The calls to SYSTEMC and the defining of IRAY can be dispensed with if error prints are added that occur when attempting to read a non-existent record.

13.2.4 ENCODE and DECODE. Although most computers with FORTRAN IV compilers have ENCODE and DECODE statement's, there are some that may not and there are others that differ from CDC's.

If the host machine does not have ENCODE and DECODE statements, it would probably be worthwhile to write subroutines that perform the functions of ENCODE and DECODE and then replace all ENCODES and DECODES in COPE with calls to those subroutines.

If the host machine has ENCODE and DECODE a check should be made to see that they take the same arguments in the same order as the CDC ENCODE and DECODE statements and, if not, the necessary changes should be made.

- 13.2.5 DATE and TIME. CDC has two subroutines DATE and TIME that respectively give an 8 character date and a 9 character time. These are only called to obtain date and time values to be printed on the title page of the output. If the user's computer does not have equivalent subroutines, the calls to DATE and TIME may be deleted.
- 13.2.6 STRACE. The subroutine STRACE causes a printing of traceback information from the current subroutine back to the main program. This information gives the subroutine and line from which STRACE was called, the subroutine and line from which that subroutine was called, and so on back to the main program.

STRACE is available on both CDC and UNIVAC but it may not exist in some FORTRAN implementations (or it may have a different name). In either case, the user will need to check this point.

13.2.7 EOF. The CDC machine has a function called EOF. The value of $\overline{\text{EOF}}$ (IUNIT) is zero if the end of file has not been encountered on I/O unit IUNIT. After a READ, a test of EOF will yield a non-zero value if the end-of-file on that I/O unit has been encountered.

The CDC statements:

READ (IUNIT, 100) iolist IF (EOF(IUNIT).NE.0.0) GO TO 99

are equivalent to:

READ (IUNIT, 100, END = 99) iolist

on most other machines.

13.2.8 COTANGENT. The PAM program uses the cotangent function (COT). If this is not a library function on the user's computer, then it should either be defined as a function (a statement function or external function) or else each occurrence of COT(X) should be replaced by (1./TAN(X)).

which specifies that an integer is to be written right justified in a field m characters wide with a minimum of n characters printed (m \geq n). This means that leading zeros are generated when the output value requires fewer than n digits. For example, if an integer variable with value 23 were to be written under I5.4 format, the result would be: b0023. Here b represents a blank so we have a field width of m=5 with n=4 characters printed even though 2 would have sufficed.

The Im.n is a standard format in FORTRAN 77, but since COPE is written in FORTRAN IV that may be of no help to the user whose FORTRAN IV compiler does not include it. On some machines a similar format (such as the UNIVAC Jn format) may be substituted; on other machines the user may have to simulate this format by using one of several different formats depending on the number of digits required to write the integer value.

13.3 GGAMA Function (IMSL).

The main COPE program uses the International Mathematical and Statistical Library (IMSL) function GGAMA. It is called from function GAMMA which is in turn called from GETTIM (it is used when the third method of playing response time is used).

If the IMSL is available on the user's computer, then it should be made available when COPE is loaded and run.

If the IMSL is not available to the user, then a function GGAMA should be written by the user or obtained from another library. It should take a random number seed IRN, an alpha parameter value (ALPHA), and return a gamma distributed random deviate R (with α = ALPHA and β = 1). The arguments IN and WK are arguments used by the IMSL routine and may or may not be used by the user's GGAMA.

CHAPTER 14

14. PREPMS PREPROCESSOR PROGRAM

14.1 General Remarks

The PREPMS preprocessor program performs three functions:

- (1) to create or modify records on the word addressable data base file (TAPE 11) by reading input cards (or card images) and writing their contents (in appropriate format and order) to TAPE 11.
- (2) to generate and print a list of the names of the current records on TAPE 11, and
- (3) to generate and print a list of the PE data records currently on TAPE 11 along with their respective parameter values (see section 5.4 for the relation of 9 parameters to PE data record names).

Because the PREPMS program is quite straightforward in design and shares many subroutines with COPE, it is not documented as thoroughly as the main COPE program; however, this chapter gives enough information to set up the input, understand the output, and generally understand what the program does.

A re-reading of Chapter 5 may be helpful in understanding what follows.

14.2 PREPMS Program Design.

. 5

The PREPMS program consists of seven subprograms: the main program PREPMS, the block data subprogram BDATA2, the subroutines NOREC2, PENAME, and SEPRC2, and the functions IDCHAR and NUMRIC.

The subprograms PENAME, IDCHAR, and NUMRIC are identical to the subprograms of the same name in COPE. BDATA2 is merely a subset of BDATA1 of COPE; that is, it contains data statements that fill in the three common blocks LOGFLG, SYMBOL, and XVALUE as does BDATA1, but it does not fill in any of the other common blocks of BDATA1 as they are not needed by PREPMS.

The subroutine SEPRC2 is nearly identical to SEPREC of COPE. The only difference is that the message about sequence numbers in columns 73-78 of the input cards is written directly to OUTPUT instead of encoded and written via a call to COMMNT.

The subroutine NOREC2 is called (as a result of using CDC's SYSTEMC feature) whenever the program attempts to read a record named OPTNNUMS from TAPE 11 but does not find such a record. This should happen only when PREPMS is creating a new TAPE 11; when PREPMS is modifying an

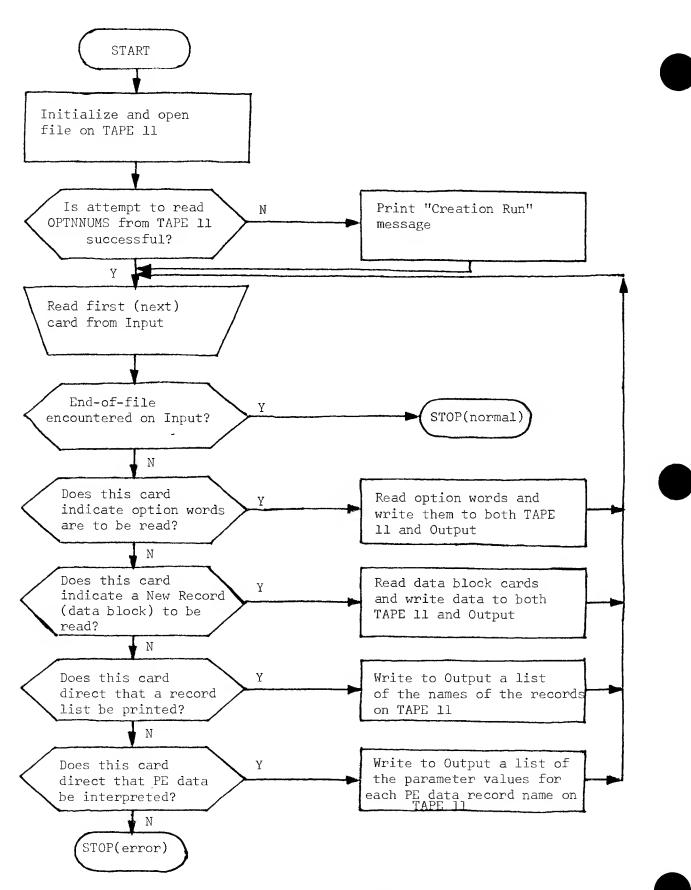


FIGURE 14-1 Logic Flow of PREPMS

existing TAPEll, there will already be an OPTNNUMS record on TAPEll. When no such record is found, NOREC2 is called; it then prints a message saying that the current job is a creation run and allows the program to continue.

The main program PREPMS is different from anything in COPE. Its main logic flow is shown in Figure 14-1. It begins by initializing (via DATA statements), calling SYSTEMC to set an error recovery procedure, and opening the file TAPEll. If it successfully reads the record named OPTNNUMS, it continues; if not, NOREC2 is called, a message is printed, and execution resumes. Next it attempts to read a card; if successful, the program continues; if unsuccessful, it has hit the end of file and a stop with normal termination message is issued.

The main program examines the card just read to determine what action to take next. Five possibilities exist:

- (1) The card indicates a set of option words follows. In this case, the option words are read, printed on OUTPUT and written to TAPE 11.
- (2) The card indicates a new record is to be read. In this case, the data for the new data block record is read, printed on OUTPUT, and written to TAPEII.
- (3) The card indicates a list of the names of the records currently on TAPEll is desired. In this case, such a list is generated and printed on OUTPUT.
- (4) The card indicates PE data record names are to be interpreted. In this case, the names of the PE data records currently on TAPEll are examined and the corresponding parameter values are determined. A list is then printed giving each PE data record's name and the corresponding parameter values.
- (5) None of the above in which case a stop with error message occurs.

Note: The terms INPUT and OUTPUT refer respectively to the files TAPE5 and TAPE6 which correspond to I/o units 5 and 6. TAPE11 corresponds to I/o unit 11 and is another name for the word addressable data base file. Note that OUTPUT (or TAPE6) normally corresponds to a line printer and INPUT (or TAPE5) corresponds to either a punched card reader or a mass storage file of card images.

14.3 Glossary of PREPMS Variables.

The majority of the PREPMS variables have the same meaning as their namesakes in the COPE program. Therefore, the glossary in this section gives definitions only for those variables different from the main COPE model.

GLOSSARY OF PREPMS VARIABLES

DEFINITION	THE RECORD NAME OF THE OPTION WORD RECORD JUST READ. NORMALLY THIS WILL BE THE ABBREVIATED FORM OF THE KEYWORD TO WHICH THE OPTION WORDS BELONG.	THE TYPE NUMBER OF THE DATA BLOCK RECORD JUST READ. ICASE = 1 FOR WEATHER DATA, 2 FOR ACQUISITION DATA, 3 FOR RESPONSE TIME DATA, 4 FOR DIRECT FIRE SUPPRESSION DATA, 5 FOR RANDOM OCCURRENCE DATA, 6 FOR PEDATA, 7 FOR POSTURE DISTRIBUTION DATA, 8 FOR INVARIANT DATA, AND 9 FOR SADARM DATA (9 IS NOT USED IN RUNNING PREPMS FOR COPE).	ILIST (21-1) IS THE NAME OF THE ITH RECORD ON TAPE 11 ILIST (21) IS A NUMBER (PRINTED IN OCTAL) GIVING THE LENGTH AND ADDRESS ON DISK (PACKED) OF THE ITH RECORD ON TAPE 11.	IOUT IS A COUNTER USED TO RECORD THE NUMBER OF ILIST ENTRIES TO BE PRINTED.	IPECOD IS THE NAME OF THE PE DATA RECORD CURRENTLY BEING EXAMINED TO DETERMINE PARAMETER VALUES.	IRLTI IS THE RECORD LENGTH OF TYPE 1 DATA BLOCK RECORDS (WEATHER DATA); IRLT2 IS THE RECORD LENGTH OF TYPE 2 DATA BLOCK RECORDS (ACQUISITION DATA);; IRLT9 IS THE RECORD LENGTH OF TYPE 9 DATA BLOCK RECORDS (SADARM DATA).	I/O UNIT FROM WHICH PE DATA IS TO BE READ (MUST BE EITHER 4 OR 5).	DESIGNATOR TYPE NUMBER (1 = GLLD, 2 = MULE, 3 = LTD).	NOPTNM(I) IS THE NUMBER OF OPTION WORD CHARACTER STRINGS CURRENTLY AVAILABLE FOR USE WITH KEYWORD NUMBER I.	NUMBER OF THE KEYWORD CORRESPONDING TO THE SET OF OPTION WORDS JUST READ.	NUMBER OF OPTION WORD CHARACTER STRINGS TO BE READ IN THIS SET OF OPTION WORDS.
UNITS						WORDS					
COMMON BLOCK	(LOCAL)	(LOCAL)	(LOCAL)	(LOCAL)	(LOCAL)	(LOCAL)	(LOCAL)	(LOCAL)	(LOCAL)	(LOCAL)	(LOCAL)
TYPE	REAL	INTEGER	INTEGER	INTEGER	INTEGER	INTEGER	INTEGER	INTEGER	INTEGER	INTEGER	INTEGER
VARIABLES	CLABEL	ICASE	ILIST(2000)	IOUT	IPECOD	IRLT1, IRLT2,, IRLT9	IUNIT	12	NOP TNM(70)	NOPTI	NREAD

GLOSSARY OF PREPMS VARIABLES - CONTINUED

DEFINITION	TEMPORARY WAME FOR THE VALUE TO BE LOADED INTO CHARA (1,1J). IT IS THE NUMBER OF THE OPTION FOR ITS OPTION WORD POSITION (GIVEN BY CHARA (2,1J) OR XLEV) TO WHICH THE CHARACTER STRING TO FOLLOW BELONGS.	PECHK IS THE FIRST FOUR CHARACTERS (LEFT JUSTIFIED WITH BLANK FILL) OF THE NAME OF THE RECORD ON TAPE!! CURRENTLY BEING EXAMINED TO DETERMINE WHETHER IT IS A PE DATA RECORD.	NAME OF CURRENT DATA BLOCK RECORD.	THESE CORRESPOND RESPECTIVELY TO THE FIRST, THIRD, FOURTH,, NINTH ARGUMENTS OF SUBROUTINE PENAME (AND ITS ENTRY PEIDNT) TI IS NOMINAL RESPONSE TIME, T3 IS TARGET VELOCITY, T4 IS GUN-TARGET RANGE, T5 IS TARGET REFLECTIVITY, T6 IS ANGLE T, T7 IS DEFLECTION BIAS, T8 IS TARGET HEADING, AND T9 IS SEEKER SENSITIVITY.	TEMPORARY NAME FOR VALUE TO BE LOADED INTO NREAD (DEFINED ABOVE).	XLEV IS TEMPORARY NAME FOR VALUE TO BE LOADED INTO CHARA(2,1J). IT IS THE OPTION WORD NUMBER FOR WHICH THE CHARACTER STRING TO FOLLOW IS A POSSIBLE CHOICE.	Y IS A TEMPORARY NAME FOR THE VALUE TO BE LOADED INTO NOPTI (DEFINED ABOVE).	TEMPORARY NAME FOR VALUE TO BE LOADED INTO ICASE (DEFINED ABOVE).
UNITS								
COMMON BLOCK	(LOCAL)	(L0CAL)	(LOCAL)	(LOCAL)	(LOCAL)	(LOCAL)	(LOCAL)	(LOCAL)
TYPE	REAL	REAL	REAL	REAL	REAL	REAL	REAL	REAL
VARIABLES	0PT	PECHK	RLABEL	T1, T3, T4, T5, T6, T7, T8, T9	×	XLEV	>-	ZCASE

To find the definition of a variable in PREPMS, one should first look in the glossary of this section. Then, if the variable is not found, look in the glossary of COPE variables in Chapter 12.

Note that all variables in common block SADARB are used only with the SADARM variant of COPE (called SOPE) and are not defined herein. This remark also applies to the WPNDAT array.

14.4 PREPMS INPUTS.

The PREPMS inputs are divided into four types:

- (1) option word records
- (2) data block records
- (3) REPORT RECORD LIST directives, and
- (4) INTERPRET PEDATA directives.

The second type (data block records) is further divided into eight types of data blocks. The sections concerning data block record types (sections 14.4.2(1) through 14.4.2(8)) also give instructions for setting up data to be read by COPE using the TEMPORARY feature (see section 4.5).

Note that if two or more option word records are read corresponding to the same keyword (see section 14.4.1) then only the last one read will have any effect. Similarly, if two or more data block records are read under the same record name, only the last one read will be retained on TAPEII. This means that any modifications to either type 1 or type 2 input (as listed above) require that the entire desired record contents be read (not just the additions).

Also, note that inputs of the four types may be arranged in any order provided that the integrity of the multiple card (or card image) input types (types 1 and 2) is preserved. However, types 3 and 4 only have effect on the file (TAPEII) as it exists at the time they are encountered; hence, they are usually put at the end of the input.

 $\frac{14.4.1\ \ Option\ \ Word\ Records}{\text{ cond (or card image) of type 1}}\ \ \text{Each option word record consists}$ of one card (or card image) of type 1 and NREAD cards of type 2 following the type 1 card.

The general form of the type 1 card is:

OPTION WORDS, keyword, m, n

or

OPTWDS, keyword, m, n

where: keyword is replaced by the character string giving the abbreviated form of the keyword to which the option words are to apply;

 \underline{m} = NREAD, a positive integer giving the number of type 2 cards to be read for this option word; and

 \underline{n} = NOPT1, a positive integer giving the keyword number (see section 5.3.9) of the keyword to which the option words are to apply.

The general form of each type 2 card is:

mm, nn, Option word character string

where: \underline{mm} = NOPTWC, the number of the option word choice to which the character string belongs (NOPTWC is a positive integer);

 \underline{nn} = NOPTW, a positive integer equal to one plus the number of the option word for which the character string is an allowed choice; and

Option word character string is the actual character string allowed as a choice.

The subsequent use of option word character string in a COPE run as a choice for option word NOPTW-1 on a keyword input card for keyword number NOPTI causes option number NOPTWC to be activated for option word NOPTW-1. (See example in section 5.3.8; for a second example, see appendixes C and D.)

Note: While blanks may be freely inserted in COPE inputs (keywords and option words) with no effect (the single exception being blanks occurring within 10 spaces after a "" - see section 4.5.3), there should be no internal blanks in the character strings on type 2 cards.

Also, no more than 2 option word character strings applying to the same keyword are allowed to correspond to a given NOPTWC, NOPTW pair.

Finally, no more than 30 type 2 cards are allowed with any type 1 card.

<u>14.4.2 Data Block Records.</u> There are eight data block record types:

- (1) Weather data
- (2) Acquisition data
- (3) Response time data
- (4) Direct Fire Suppression data
- (5) Random Occurrence data
- (6) PE (probability of engagement data)
- (7) Target Posture Distribution data
- (8) Invariant data

The formatting of the input required for each of these types is presented in a separate subsection of this section.

Note that these eight data blocks correspond exactly to the eight data blocks that can be used with the TEMPORARY option in COPE. Furthermore, the formats used by COPE under the TEMPORARY option and by PREPMS are identical except for the first card (or card image) of each set. The sections that follow give the set-ups required for use with either program.

The first card (header card) in each case is free format: blanks may be freely inserted, fields are defined by separators (commas, for example). Subsequent cards of each data block type are formatted FORTRAN inputs and care must be taken to conform to the specified formats.

1. Weather Data Block Input.

When reading weather data into PREPMS for transfer onto TAPEII, the first card (which indicates a weather data record is to be input) must be of the form:

NEW RECORD, record name, 1

or

NEW REC, record name, 1

where record name is the name of the weather data record to be read. (See section 5.3.1 for the form of weather data record names).

When using the TEMPORARY option with COPE, the weather data is headed by a card of the form:

TEMPORARY, WEATHER or TEMPORARY, W

or

TEMP, WEATHER or TEMP, W

In either case (whether reading weather data in PREPMS or COPE), the remaining cards of the weather data are as follows:

WEATHER DATA

_CARD SET

Variable name	STINU	Format	columns	Description
NCC		15	1-5	Number of different cloud ceiling altitude values used with the curren weather data. (If NCC >6, then arradimension changes are required).
IVL		15	6-10	Number of different visibility range limits used with the current weather data. (If NVL + 11, then array dimension changes and program modifications are usually required).
*				
			İ	
			*	
		1	14-9	

WEATHER DATA ____CARD SET

Variable name	UNITS	Format	columns	Nescription
PRCLCG		F10.4	1-10	Probability that there is a cloud ceiling.
PRCFLS(1)		F10.4	11-20	Probability that there is a cloud free line-of-sight given that there i a cloud ceiling.
PRCFLS(2)		F10.4	21-30	Probability that there is a cloud fre line-of-sight given that there is no cloud ceiling (i.e., scattered clouds only).
			1 1 1 1	
		F		

WEATHER DATA CARD SET

Card No. 4ª

Variable name	STINU	Format	columns	Description
PRGCFL(1,1)		F1a.4	1-10	PRGCFL(I,1) is the probability that the visibility range limit is equal to
PRGCFL(2,1)		F10.4	11-21	I kilometers given that there is a cloud ceiling and a cloud free line-of-sight. Note: The visibility range limit is considered to be I kilometers if (I-1/2)km < visibility range limit <(I+1/2)km.
PRGCFL(8,1)		F10.4	71-80	
				•
		·		
	1.	7.	14-11	1

WEATHER DATA CARD SET

Variable name	UNITS	Format	columns	Mescription
PRGCFL(9,1)		F10.4	1-10	PRGCFL(I,1) is described on previous page.
1				
PRGCFL(11,1)		F10.4	21-30	
			• • •	
				• 1 1
]	
			; :	
	-			

WEATHER DATA

____CARD SET

Card No. 5a

Variable name	UNITS	Format	columns	Nescription
PRGCFL(1,2)		F10.4	1-10	PRGCFL(I,2) is the probability that the visibility range limit is equal to I kilometers given that there is no cloud ceiling and that
PRGCFL(2,2)		F10.4	11-20	there is a cloud free line-of-sight. The note on card 4a applies.
PRGCFL(8,2)		F10.4	71-80	
			7	
			!	

WEATHER DATA CARD SET

Card No. 5b

Variable name	UNITS	Format	columns	Nescription
PRGCFL(9,2)		F10.4	1-10	PRGCFL(I,2) is described on previous page.
PRGCFL(11,2)		F10.4	21-30	
			14-14	

WEATHER DATA

_CARD SET

Variable name	UNITS	Format	columns	Nescription
W(1,1,1)		F10.4	1-10	W(I,J,1) is the probability of having the Ith cloud ceiling altitude
W(2,1,1)		F10.4.	11-20	and the Jth visibility range limit given that there is a cloud ceiling but no cloud free line-of-sight.
W(3,1,1)		F10.4	21-30	
W(4,1,1)		F10.4	31-40	
W(5,1,1)		F10.4	41-50	
W(6,1,1)		F10.4	51-60	
		1	14-15	

WEATHER DATA CARD SET

Card No. 6b

Variable name	2T I NU	Format	columns	Nescription
W(1,2,1)		F10.4	1-10	W(I,J,1) is as defined on previous page.
W(2,2,1)		F10.4	11-20	
W(3,2,1)		F10.4	21-30	
W(4,2,1)		F10.4	31-40	
W(5,2,1)		F10.4	41-50	
W(6,2,1)		F10.4	51-60	
			- Common -	; ;
			1 10	
	1		14-16	I

Cards 6c through 6k are similar to cards 6a and 6b except each successive card contains W(I,J,l) values for a higher value of J:

card "" "" ""	66 66 66 66 66 66 66 66 66 66 66 66 66	contains " " " " " " " " "	W(1,1,1) W(1,2,1) W(1,3,1) W(1,4,1) W(1,5,1) W(1,6,1) W(1,7,1) W(1,8,1) W(1,9,1)	through	W(6,1,1) W(6,2,1) W(6,3,1) W(6,4,1) W(6,5,1) W(6,6,1) W(6,7,1) W(6,8,1) W(6,9,1) W(6,10,1)
11	6j 6k	u u	W(1,10,1) W(1,11,1)	11	W(6, 10, 1) W(6, 11, 1)

Each of these cards contains six values, $\left\{W(1,J,1), W(2,J,1), W(3,J,1), W(4,J,1), W(5,J,1), \text{ and } W(6,J,1)\right\}$, in 6F10.4 format (exactly as illustrated for cards 6a and 6b on the

previous two pages).

WEATHER DATA

_CARD SET

Card No.7a

Variable name	UNITS	Format	columns	Nescription
W(1,1,2)		F10.4	1-10	W(I,J,2) is the probability of
W(2,1,2)		F10.4	11-20	having the Ith cloud ceiling altitude and the Jth visibility range limit
W(3,1,2)		F10.4	21-30	given that there is no cloud ceiling and no cloud free line-of-sight.
W(4,1,2)		F10.4	31-40	
W(5,1,2)		F10.4	41-50	
W(6,1,2)		F10.4	51-60	
		1		
			!	
			!	
)	
			·	
1			14-18	

WEATHER DATA CARD SET

Card No. <u>7b</u>

Variable name	UNITS	Format	columns	Nescription
W(1,2,2)		F10.4	1-10	W(I,J,2) is as defined on previous page.
W(2,2,2)		F10.4	11-20	page.
W(3,2,2)		F10.4	21-30	
W(4,2,2)		F10.4	31-40	
W(5,2,2)		F10.4	41-50	
W(6,2,2)		F10.4	51-60	
			F	
			1	· ·
				; ;
,				
			[]]	
			1	
			!	; ; !
		1	14-19	

Cards 7c through 7k are similar to cards 7a and 7b except each successive card contains W(I,J,2) values for a higher value of J:

card	7a	contains	W(1,1,2)	through	W(6,1,2)
	7b 7c	" II	W(1,2,2)	11	W(6,2,2) W(6,3,2)
н	7d	п	W(1,4,2)	u	W(6,4,2)
Ш	7e	II	W(1,5,2)	II	W(6,5,2)
II.	7f	п	W(1,6,2)	Ш	W(6,6,2)
ш	7g	п	W(1,7,2)	II	W(6,7,2)
11	7h	II .	W(1,8,2)	11	W(6,8,2)
ш,	7i	u	W(1,9,2)	II	W(6,9,2)
п	7j.	u	W(1,10,2)	11	W(6,10,2)
Ш	7k	II	W(1,11,2)	11	W(6,11,2)

Each of these cards contains six values, $\{W(1,J,2), W(2,J,2), W(3,J,2), W(4,J,2), W(5,J,2), and W(6,J,2)\}$, in 6F10.4 format (exactly as illustrated for cards 7a and 7b on the previous two pages).

WEATHER DATA __CARD SET

Card No. 8a

Variable name	UNITS	Format	columns	Nescription
VISLIM(1)	km.	F10.4	1-10	VISLIM (I) is the Ith visibility
VISLIM (2)	km.	F10.4	11-20	range limit value. Any choice other than VISLIM(I) = I kilometers will require program
VISLIM (3)	km.	F10.4	21-30	changes to COPE.
1	1	1		
1		1		
1	,			
1	ı	r		
VISLIM (8)	km.	F10.4	71-80	
, .				
			i	
		4	14-21	

WEATHER DATA ____CARD SET

Card No. 8b

Variable name	UNITS	Format	col umns	Nescription
VISLIM (9)	km.	F10.4	1-10	VISLIM (I) is as described on previous page.
1	1	•		
VICITM (11)	, ,	F10.4	21-30	
VISLIM (11)	km.	F10.4	21-30	
				1
				!
				!
			-	
				!
				1 1
			:	
	1	- 1		

WEATHER DATA

CARD SET

	1	Format	columns	Nescription
CLOUD (1)	meters	F10.4	1-10	CLOUD (I) is the Ith cloud ceiling altitude in meters used for the current set of weather data.
CLOUD (2)	meters	F10.4	11-20	current set of weather data.
CLOUD (3)	meters	F10.4	21-30	
CLOUD (4)	meters	F10.4	31-40	
CLOUD (5)	meters	F10.4	41-50	
CLOUD (6)	meters	F10.4	51-60	1
			:	

WEATHER DATA CARD SET Card No. 10

Variable name	UNITS	Format	columns	Nescription
PASQL (1)		F10.4	1-10	PASQL(I) is the probability of occurrence of the Ith Pasquill atmospheric stability category.
PASQL (2)		F10.4	11-20	(Category A corresponds to I=1, B to I=2, etc.)
PASQL (3)		F10.4	21-30	
PASQL (4)		F10.4	31-40	
PASQL (5)		F10.4	41-50	
PASQL (6)		F10.4	51-60	
			-	
		-		
			- - - -	
		1	14-24	

WEATHER DATA ____CARD SET

Variable name	UNITS	Format	col umns	Nescription
WNDSPD (1) WNDSPD (2) WNDSPD (3)		F10.4 F10.4 F10.4	1-10 11-20 21-30	WNDSPD (I) is the probability that the windspeed is in speed bracket I. (Speed bracket I=1 includes windspeeds from 0 to 5 knots, I=2 includes from 5 to 15 knots and I=3 includes 15 knots and over).
			14-25	

WEATHER DATA CARD SET

Variable name	UNITS	Format	columns	Nescription
HUMID (1)		F10.4	1-10	HUMID (1) is the probability that the relative humidity is less than 65%;
HUMID (2)		F10.4	11-20	HUMID (1) is the probability that the relative humidity is less than 65%; HUMID (2) is the probability that the relative humidity is greater than (or equal to) 65%.
			1	
1		_	14-26	

2. Acquisition Data Block Input.

When reading acquisition data into PREPMS for transfer onto TAPE11, the first card (which indicates an acquisition data record is to be read) must be of the form:

NEW RECORD, record name, 2

or

NEW REC, record name, 2

where record name is the name of the acquisition data record to be read (see section 5.3.2 for the form of acquisition data record names).

When using the TEMPORARY option with COPE, the acquisition data is headed by a card of the form:

TEMPORARY, ACQUISITION RANGE DISTRIBUTION

or

TEMPORARY, ACQRNGDIST

or

TEMP, ACQUISITION RANGE DISTRIBUTION

or

TEMP, ACQRNGDIST

In either case (whether reading acquisition data in PREPMS or COPE), the remaining cards of the acquisition data are as follows:

ACQUISITION DATA

____CARD SET Card No. 2

NPP I5 5-10 Number of points used with range class to describe of distribution of line-of-segment lengths. NRNGCL I5 I1-15 Number of range class bout to be used (equals one letthe number of range class Note: Zerc is always asset the lower boundary of the range class so it need not explicitly entered as interest.	Variable name	UNITS	Format	columns	Nescription
NRNGCL I5 I1-15 Number of range class bout to be used (equals one lethe number of range class Note: Zerc is always asset the lower boundary of the range class so it need not explicitly entered as in counted as a boundary value.	NRP		15	1-5	Number of range points used in the CRNGD array (Cumulative distribution of acquisition (unmasking) ranges.)
to be used (equals one le the number of range class Note: Zerc is always ass the lower boundary of the range class so it need no explicitly entered as in counted as a boundary ya	NPP		15	5-10	Number of points used within each range class to describe cumulative distribution of line-of-sight segment lengths.
	NRNGCL		15	11-15	Number of range class boundary value to be used (equals one less than the number of range classes) Note: Zerc is always assumed to be the lower boundary of the shortest range class so it need not be explicitly entered as input nor counted as a boundary value for
14-28					

ACQUISITION DATA

___CARD SET

Card No. <u>3a</u>

Variable name	UNITS	Format	columns	Nescription
CRNGD(1,1) CRNGD(2,1)		F10.4	1-10	CRNGD(I,1) is the probability that the designator-to-target range at time of target unmasking is less than or equal to the value in CRNGD(I,2)
CRNGD(3,1)		F10.4	21-30	Note: CRNGD(1,1) = 0.0
1			/ / !	and CRNGD(NRP,1) = 1.0 must be satisfied. Also, the entries must increase as I increases.
CRNGD(8,1)		F10.4	71-80	
				Note: If NRP < 8, only one card of this type will be needed; if NRP > 8, then a second card must continue with CRNGD(9,1) through CRNGD(NRP,1). NRP cannot exceed 11 with current dimensions.
			14-29	

ACQUISITION DATA CARD SET

Card No. 3b

Variable name	UNITS	Format	columns	Nescription
CRNGD(1,2) CRNGD(2,2)	meters meters i meters	F10.4 F10.4 I I I F10.4	1-10 11-21	CRNGD(I,2) is the range value corresponding to the cumulative probability value in CRNGD(I,1). The values must increase as I increases. Note: If NRP < 8, only one card of this type will be needed; if NRP > 8, then a second card must continue with CRNGD(9,2) through CRNGD(NRP,2) NRP canno exceed 11 with current dimensions.
			14-30	

ACQUISITION DATA CARD SET

Card No. 4a

Variable name	UNITS	Format	columns	Mescription
SEGLOS(1,1)		F10.4	1-10	SEGLOS(I,1) is the probability that the length of a line-of-sight segment in range class K is less
SEGLOS(2,1)		F10.4	11-20	than or equal to SEGLOS(I, K+1) meters.
		/		Note:
1		/		SEGLOS(1,1) = 0.0
		' ,		SEGLOS(NPP,1) = 1.0 and SEGLOS(I,1) < SEGLOS(I+1,1)
i		1		for I = 1,2, NPP-1.
1		'	[{	
SEGLOS(8,1)		F10.4	71-80	i i
				If NPP <8, only one card of this type will be needed; if NPP >8, then a second card must continue with SEGLOS (9,1) through SEGLOS(NPP,1). NPP cannot exceed the current dimensions.
				1
			! !	:
			!	<u>:</u>
			14-31	
		+	1	

ACQUISITION DATA

____CARD SET

Card No. 4b

The SEGLOS array is read from additional cards similar to 4b up to a maximum of 11 cards (or card pairs if NNP >8).

Each card (or card pair if NPP >8) has the following content:

" 4i " SEGLOS(1,9) " SEGLOS(NPP,9) " 4j " SEGLOS(1,10) " SEGLOS(NPP,10) " 4k " SEGLOS(1,11) " SEGLOS(NPP,11)	card	4b 4c 4d 4e 4f 4g	contains " " " "	SEGLOS(1,1) SEGLOS(1,2) SEGLOS(1,3) SEGLOS(1,4) SEGLOS(1,5) SEGLOS(1,6) SEGLOS(1,7) SEGLOS(1,8)	through " " " " " " " "	SEGLOS(NPP,1) SEGLOS(NPP,2) SEGLOS(NPP,3) SEGLOS(NPP,4) SEGLOS(NPP,5) SEGLOS(NPP,6) SEGLOS(NPP,7) SEGLOS(NPP,8)
" 4f " SEGLOS(1,6) " SEGLOS(NPP,6) " 4g " SEGLOS(1,7) " SEGLOS(NPP,7) " 4h " SEGLOS(1,8) " SEGLOS(NPP,8) " 4i " SEGLOS(1,9) " SEGLOS(NPP,9) " 4j " SEGLOS(1,10) " SEGLOS(NPP,10)	П	4d				
" 4f " SEGLOS(1,6) " SEGLOS(NPP,6)" " 4g " SEGLOS(1,7) " SEGLOS(NPP,7) " 4h " SEGLOS(1,8) " SEGLOS(NPP,8) " 4i " SEGLOS(1,9) " SEGLOS(NPP,9) " 4j " SEGLOS(1,10) " SEGLOS(NPP,10)	Ш	4e	II .	SEGLOS(1,5)		
" 4g " SEGLOS(1,7) " SEGLOS(NPP,7) " 4h " SEGLOS(1,8) " SEGLOS(NPP,8) " 4i " SEGLOS(1,9) " SEGLOS(NPP,9) " 4j " SEGLOS(1,10) " SEGLOS(NPP,10)	н	_	п	SEGLOS(1.6)	j i	
" 4h " SEGLOS(1,8) " SEGLOS(NPP,8) " 4i " SEGLOS(1,9) " SEGLOS(NPP,9) " 4j " SEGLOS(1,10) " SEGLOS(NPP,10)	п		II		j1	
" 4i " SEGLOS(1,9) " SEGLOS(NPP,9) " 4i " SEGLOS(1,10) " SEGLOS(NPP,10)	н		II.		ji	
" 4j " SEGLOS(1,10) " SEGLOS(NPP,10)	u		11		H	SEGLOS(NPP,9)
4.1 aco ocupo 11\	ш		ш		н	SEGLOS(NPP,10)
	11	4J 4k	II		if	

If NPP >8 then each card above is replaced by a card pair. In this case, the first card of each pair contains eight values and the second card contains NPP-8 values (each card is in 8F10.4 format). SEGLOS(1,J) through SEGLOS(NPP,J) contain (for J>2) the line-of-sight segment lengths in meters for range class J-l corresponding respectively to the cumulative probability values in SEGLOS(1,1) through SEGLOS(NPP,1). The total number of cards (or card pairs if NPP>8) will be NRNGCL + 1 (one for probabilities plus one for each range class). Hence, if NRNGCL = 10, all cards 3a through 3k will be used; but, if NRNGCL <10, then only the first NRNGCL + 1 cards (or card pairs if NPP >8) shown above will be used.

ACQUISITION DATA ____CARD SET

Variable name	UNITS	Format	columns	Pescription .
RNGCLB(1) RNGCLB(2) I RNGCLB(8)	meters meters i meters	F10.4 F10.4 (F10.4	1-10. 11-20 ' ' ' ' ' '71-80	RNGCLB(I) is the Ith non-zero range class boundary. That is, range class I runs from zero to RNGCLB(I) meters and, for I > 1, range class I runs from RNGCLB(I-1) meters to RNGCLB(I) meters. (When the DO-to-target unmask range lies in range class I, then the (I + 1)st row of the SEGLOS array is sampled to obtain LOS segment lengths.) Note that O <rngclb(i)< <8,="" <rngclb(i)="" <rngclb(i+1)<="" <∞.="" also="" but,="" card="" if="" is="" needed;="" note="" nrngcl="" of="" one="" only="" that="" then="" this="" type=""> 8, then a second card must continue with RNGCLB(9) through RNGCLB(NRNGCL). Finally, RNGCLB cannot exceed 10 with current dimensioning.</rngclb(i)<>
			14-34	

ACQUISITION DATA ____CARD SET

Card No. 6a

Variable name	UNITS	Format	columns	Nescription
VELTBL(1,1)	M/S	F10.4	1-10	VELTBL(I,J) gives the target velocity default value in the current terrain under
VELTBL(2,1)	M/S	F10.4	11-20	day/night condition I and weather condition J. I = 1 for day time 2 for nighttime
				J = 1 for "good" weather 2 for "bad" weather
		,		
			:	
		+	14-35	-

ACQUISITION DATA CARD SET

Card No. 6b

Variable name	UNITS	Format	columns	Nescription
/ELTBL(1,2)	M/S	F10.4	1-10	(see previous page)
/ELTBL(2,2)	M/S	F10.4	11-20	
		•		
	u.			
,		!	:	
			14-36	

3. Response Time Data Block Input.

When reading response time data into PREPMS for transfer to TAPEII, the first card (which indicates that a response time data record is to be read) must be of the form:

NEW RECORD, record name, 3

or

NEW REC, record name, 3

where record name is the name of the response time record to be read (see section 5.3.3. for response time record names).

When using the TEMPORARY option with COPE, the response time data is headed by a card of the form:

TEMPORARY, RESPONSE TIME

or

TEMPORARY, RESPTIME

or

TEMP, RESPONSE TIME

or

TEMP, RESPTIME

Note: When the first method (section 2.2.9) of modeling delay times in $\overline{\text{COPPERHEAD}}$ mission communication and processing is played, in COPE, the response time distribution used is the one defined by data statements in BDATAl (namely, the FSRT array - see section 4.7.6).

Because this array is sampled to obtain response times, the values on cards 4, 5, and 6 of this card set are not used. However, cards must still be input (though they may be blank) so that the statements which read the later cards of this set will pick up the correct data.

The record name used with the data for the first method of playing response time must be RSPDAT0123 unless one makes code changes in COPE to allow for others.

In any case (whether reading response time data in PREPMS or COPE), the remaining cards of the response time data are as follows:

RESPONSE TIME _____CARD SET

Card No. 2_____

Variable name	UNITS	Format	columns	Description
NDT		15	1-5	Number of points to be entered in each row of DETTMA array. NDT ≤10 with current dimensions.
			: : : : 14-38	

RESPONSE TIME ____CARD SET

Card No. 3a

Variable name	UNITS	Format	columns	Nescription
DETTMA (1,1) DETTMA (2,1)		F10.4 F10.4	1-10 11-20	DETTMA (I,1) is the probability that the "detection" time is less than or equal to DETTMA(I,2) seconds.
1 1		1 1		Note: DETTMA (1,1) = 0.0 and DETTMA (I) < DETTMA (I +1)
DETTMA(8,1)		F10.4	71-80	Also note that if NDT < 8, only one card of this type is required; if NDT > 8, then a second card is required with DETTMA (9,1) through DETTMA (NDT,1).
		-	14-39	

RESPONSE TIME CARD SET

Card No. 3b

Variable name	UNITS	Format	columns	Nescription
DETTMA (2,1) DETTMA (2,2) DETTMA (8,2)	seconds seconds i seconds	F10.4 F10.4 F10.4 F10.4	1-10 11-20 1 1 71-80	DETTMA (I,2) is the "detection" time in seconds corresponding to DETTMA (I,1). Note: DETTMA (I) < DETTMA (I+1) Also, if NDT ≤ 8 only one card is needed; if NDT > 8, then DETTMA (9,2) through DETTMA (NDT,2) continue on a second card.
		1	14-40	

RESPONSE TIME

CARD SET

Variable name	UNITS	Format	columns	Nescription
BATRTM (1)	seconds	F10.4	1-10	BATRTM (I) is the response time at the battery for a Copperhead
BATRTM (2)	seconds	F10.4	11-20	mission of type I. I = l for preplanned targets
BATRTM (3)	seconds	F10.4	21-30	I = 2 for targets of opportunity
XMVADF (1)	seconds	F10.4	31-40	I = 3 for priority preplanned targe XMVADF (I) is the time required to transmit message via voice commo after failing to transmit
XMVADF (2)	seconds	F10.4	41-50	via digital commo. I = 1 for pre-planned targets (priority or not) I = 2 for targets of opportunity Note: The first way of modeling delatimes does not use the data on cards 4, 5, and 6; hence, they may be left blank. The second way of modeling delatimes does not use any RESPONSE TIME data block values, so no record is prepared corresponding to the PARAM option. Finally, the third delay time model uses all data in the data block See sections 2.2.9, 4.4.15 and 9.23 for further details on the three delay time models.
			14-41	

RESPONSE TIME CARD SET

Variable name	UNITS	Format	columns	nescription
BCSPTM (1,1)	seconds	F10.4	1-10	BCSPTM (I,J) is the battery com- puter system processing time for
BCSPTM (2,1)	seconds	F10.4	11-20	commo type I and mission type J.
BCSPTM (1,2)	seconds	F10.4	21-30	I·= 1 for digital commo I = 2 for voice commo
BCSPTM (2,2)	seconds	F10.4	31 –40	J = 1 for pre-planned target (priority or not)
XMTT1M (1,1)	seconds	F10.4	41-50	<pre>J = 2 for target of opportunity XMTTIM (I,J) is the commo trans- mission time for commo type I and</pre>
XMTT1M (2,1)	11	F10.4	51-60	and mission type J where I and J are as for BCSPTM above.
XMTT1M (1,2)	n	F10.4	61-70	
XMTT1M (2,2)	it	F10.4	71-80	
			14-42	

RESPONSE TIME

_CARD SET

Variable name	UNITS	Format	columns	^D escription
TMEAN (1,1)	seconds	F10.4	1-10	TMEAN (I,J) is the mean time for DO to enter data in the digital
TMEAN (2,1)	seconds	F10.4	11-20	message device in day/night condition I and mission type J.
TMEAN (1,2)	seconds	F10.4	21-30	I = 1 for day time I = 2 for night
TMEAN (2,2)	seconds	F10.4	31-40	J = 1 for pre-planned target (priority or not)
TSIGMA (1,1)	seconds	F10.4	41-50	J = 2 for target of opportunity TSIGMA (I,J) is the standard deviation of the distribution of
TSIGMA (2,1)	seconds	F10.4	51-60	times required for the DO to enter data in digital message device under
TSIGMA (1,2)	seconds	F10.4	61-70	day/night condition I and mission type J.
TSIGMA (2,2)	seconds	F10.4	71-80	I and J are as defined above for TMEAN.
			14-43	

RESPONSE TIME ____CARD SET

Variable name	UNITS	Format	columns	Nescription
TRARRY (1,1)	seconds	F10.4	1-10	TRARRY (I,J) is the nominal response time for mission type I
TRARRY (2,1)	seconds	F10.4	11-20	and commo type J.
TRARRY (3,1)	seconds	F10.4	21-30	<pre>I = 1 for pre-planned targets I = 2 for targets of opportunity I = 3 for priority pre-planned</pre>
TRARRY (1,2)	seconds	F10.4	31-40	targets.
TRARRY (2,2)	seconds	F10.4	41-50	J = 1 for digital commo
TRARRY (3,2)	seconds	F10.4	51-60	J = 2 for voice commo
				Note: These nominal response times a not to include time-of-flight. (TOF added in COPE itself to obtain TRBAR
•			:	
			14-44	

4. Direct Fire Suppression Data Block Input.

When reading direct fire suppression data into PREPMS for transfer to TAPE 11, the first card (which indicates that a direct fire suppression data record is to be read) must be of the form:

NEW RECORD, record name, 4

٥r

NEW REC, record name, 4

where record name is the name of the direct fire suppression record to be read (see section 5.3.4 for direct fire suppression record names).

When using the <u>TEMPORARY</u> option with COPE, the direct fire suppression data is headed by a card of the form:

TEMPORARY DIRECT FIRE SUPPRESSION

or

TEMPORARY, DFIRE SUPPR

or

TEMP, DIRECT FIRE SUPPRESSION

or

TEMP, DFIRE SUPPR

In either case (whether reading direct fire suppression data in PREPMS or COPE), the remaining cards of the direct fire suppression data are as follow:

DIRECT FIRE SUPPRESSION CARD SET

Variable name	UNITS	Format	columns	nescription
NDFSP		15	1-5	Number of points to be entered for each of the three rows of the DFDOKL array. (Number of range points for DFDOKL array).
				With current dimensions, NDFSP≤10.
			•	
				} ! !
				1
			• •	
			!	: j
		1	14-46	

DIRECT FIRE SUPPRESSION CARD SET

Card No. <u>3a</u>

Variable name	UNITS	Format	columns	Nescription
DFDOKL (1,1) DFDOKL (2,1) OFDOKL (8,1)	meters meters i t meters	F10.4 F10.4 F10.4 F10.4	1-10 11-20 1 1 71-80	DFDOKL (I,1) is the range in meters corresponding to a probability of DO being suppressed (obscured) of DFDOKL (I,2) and a probability of DO being killed of DFDOKL (I,3) DFDOKL (1,1) = 0.0 and DFDOKL (I,1) < DFDOKL (I+1,1). If NDFSP>8, then a second card is required for DFDOKL (9,1) through DFDOKL (NDFSP,1).
			14-47	

DIRECT FIRE SUPPRESSION CARD SET Card No. 3b

Variable name	UNITS	Format	columns	Nescription
DFDOKL (1,2) DFDOKL (2,2)		F10.4	1-10	DFDOKL (I,2) is the probability that direct fire dust from the target at range DFDOKL (I,1) obscures the DO (but he is not killed) If NDFSP>8, then a second card
DFDOKL (8,2)		F10.4	71-80	If NDFSP>8, then a second card is needed for DFDOKL (9,2) through DFDOKL (NDFSP,2).
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		1	**************************************	
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		1		
	-		14-48	

DIRECT FIRE SUPPRESSION CARD SET Card No. 3c

Variable name	UNITS	Format	columns	Nescription
DFDOKL (1,3) DFDOKL (2,3)		F10.4	1-10 11-20	DFDOKL (I,3) is the probability that direct fire from the target at range DFDOKL (I,1) kills the DO.
DFDOKL (8,3)		F10.4	71-80	If NDFSP > 8, then a second card is needed for DFDOKL (9,3) through DFDOKL (NDFSP,3)
			14-49	

5. Random Occurrence Data Block Input.

When reading random occurrence data in PREPMS for transfer to TAPE 11, the first card (which indicates that a random occurrence data record is to be read) must be of the form:

NEW RECORD, record name, 5

or

NEW REC, record name, 5

where record name is the name of the random occurrence record to be read (see section 5.3.5 for random occurrence record names).

When using the TEMPORARY option with COPE, the random occurrence data is headed by a card of the form:

TEMPORARY, RANDOM OCCURRENCE DISTRIBUTION

or

TEMPORARY, RODIST

or

TEMP, RANDOM OCCURRENCE DISTRIBUTION

or

TEMP, RODIST

In either case (whether reading random occurrence data in PREPMS or COPE), the remaining cards of the random occurrence data are as follow:

Card No. 2____

Variable name	UNITS	Format	columns	Description
NPLOSR		15	1-5	Number of range classes for probability of LOS data for random occurrence.
				Current dimensions require NPLOSR≤10.
				-
ļ				
			1 1 1	
) •
			And continues of	
			: 	
		1	14-51	

Variable name	UNITS	Format	. Columns	Nescription
	UNITS	Format	columns	Pescription Critical time for laser designation (i.e., the length of the time interval immediately prior to impact during which the target must be continuously lased in order to have a successful Copperhead mission).
			14-52	

Variable name	UNITS	Format	columns	Nescription
RNGPLS (1) RNGPLS (2) I I RNGPLS (8)	meters	F10.4 F10.4 F10.4	1-10 11-20 1 1 1 71-80	RNGPLS (I) is the upper limit of the Ith range class for random occurrence line of sight data. Range class I extends from zero to RNGPLS (1); range class I for I>1 extends from RNGPLS (I) to RNGPLS (I+1). RNGPLS(I) < RNGPLS (I+1) If NPLOSR > 8, then a second card must be used to contain RNGPLS (9) through RNGPLS (NPLOSR).
	1	1.	1	

Card No. <u>5</u>

Variable name	UNITS	Format	columns	Nescription
PRBLOS (1)		F10.4	1-10	PRBLOS (I) is the probability that a single vehicle in range class I is in view of the DO for the final TCRIT seconds of the Copperhead flight.
PRBLOS (8)		F10.4	71-80	If NPLOSR >8, then a second card is needed to contain PRBLOS(9) through PRBLOS(NPLOSR).
			14-54	

6. PE Data Block Input.

When reading PE data in PREPMS for transfer to TAPE 11, the first card (which indicates that a PE data record is to be read) must be of the form:

NEW RECORD, record name, 6

or

NEW REC, record name, 6

where record name is the name of the PE data record to be read (see section 5.4 for PE record names).

When using the TEMPORARY option with COPE, the PE data are headed by a card of the form:

TEMPORARY, PEDATA

or

TEMP, PEDATA

In either case (whether reading PE data in PREPMS or COPE), there is an optional card that can be inserted next:

USE TAPE 4

If this card is used, then the program (PREPMS or COPE) reads the remaining cards of the PE data from I/O unit 4 instead of the normal I/O unit 5; if this card is not used, then the PE data are read from I/O unit 5. In either case (whether I/O unit 4 or 5 is used), the remaining PE data cards are as described after this note:

Note: Because the PAM program (see Chapter 16) can write the PE data records directly to TAPE 11 without any need to run PREPMS, it is very unlikely that the need will arise to use PREPMS (or COPE) to read PE data as described in this section; however, the capability is provided.

PE DATA CARD SET

Card No. <u>2a - 2dd</u>

Variable name	UNITS	Format	columns	Nescription
INDEX (I,J,1) INDEX (I,J,2)		15	1-5 6-10	INDEX (I,J,K) = 10*(I-1)+2*(J-1)+K where K = 1,2 J = 1,2,,5 I = 1,2,,6
				The values are read two to a card and the values are arranged varying K first, then J, and then I.
				This procedure yields a set of 30 cards. The Nth such card having the values (2N-1) and 2N on it in 2I5 format.
				The index array is used to access the PETBL array.
		ļ		
		,		
	1	!	14-56	

PE DATA CARD SET

Card No. $\frac{3a - 3b^{24}}{(600 \text{ cards})}$

Variable name	UNITS	Format	columns	Nescription
PETBL (I,J,1) PETBL (I,J,2)		F10.4	1-10	PETBL (I,J,K) is the probability of engagement value for DO-to-target range K, visibility range J, and
PETBL (I,J,3)		F10.4	21-30 31-40	index value I. The values are input seven per card so that K varies first, then J, and finally I.
PETBL (I,J,4) PETBL (I,J,5)		F10.4 F10.4	41-50	K = 1,2,,7 $J = 1,2,,10$ $I = 1,2,,60$
PETBL (I,J,6) PETBL (I,J,7)		F10.4	61-70	This makes for a total of 600 cards with seven entries per card in 7F10.4 format.
			14-57	

7. Posture Data Block Input.

When reading posture data in PREPMS for transfer to TAPE 11, the first card (which indicates that a Target Posture data record is to be read) must be of the form:

NEW RECORD, record name, 7

or

NEW REC, record name, 7

where record name is the name of the target posture data to be read (see section 5.3.6 for target posture record names).

When using the <u>TEMPORARY</u> option with COPE, the target posture data are headed by a card of the form:

TEMPORARY, TARGET POSTURE DISTRIBUTION

or

TEMPORARY, TGTPSTDIST

or

TEMP, TARGET POSTURE DISTRIBUTION

or

TEMP, TGTPSTDIST

In either case (whether reading target posture data in PREPMS or COPE), the remaining cards of the target posture data are as follow:

POSTURE DATA

CARD SET

Variable name	UNITS	Format	columns	Description
VRNGPS		15	1-5	Number of range classes used for target posture data.
				Current dimensions require NRNGPS ≤10.
		4	14-59	

POSTURE DATA CARD SET

Variable name	UNITS	Format	columns	Description
RNGPST (1)	meters	F10.4	1-10	RNGPST (I) is the upper limit of
RNGPST (2)	meters	F10.4	11-20	the Ith range class for posture data.
RNGPST (3)	meters	F10.4	21-30	The first range class runs from
i	1	4	1	zero to RNGPST (1); the Ith range class extends from RNGPST (I) to RNGPST (I+1).
RNGPST (8)	meters	F10.4	71-80	Note RNGPST (I) < RNGPST (I+1) Also, if NRNGPS>8, the a second card is required: for RNGPST (9) through RNGPST (NRNGPS).
			,	
			T	
			and the state of t	
		1	14-60	

POSTURE DATA _____CARD SET

Card No. 4a

Variable name	UNITS	Format	columns	Nescription
PSTTBL (1,1) PSTTBL (2,1)		F10.4 F10.4 F10.4	1-10 11-20 71-80	PSTTBL (I,1) is the probability that the target is completely obscured when at DO-to-target range RNGPST (I). If NRNGPS > 8, then a second card is required for PSTTBL (9,1) through PSTTBL (NRNGPS,1).
			14-61	

POSTURE DATA CARD SET Card No. 4h

Variable name	UNITS Format	columns	Nescription
PSTTBL (1,2) PSTTBL (2,2) PSTTBL (8,2)	F10.4 F10.4 F10.4	1-10 11-20 1 1 71-80	PSTTBL (I,2) is the probability that the target is fully exposed when at DO-to-target range RNGPST (I). As usual, if NRNGPS> 8, a second card is needed for PSTTBL (9,2) through PSTTBL (NRNGPS,2).

POSTURE DATA CARD SET

Card No. 4c

Variable name	UNITS	Format	columns	nescription
PSTTBL (1,3) PSTTBL (2,3) PSTTBL (8,3)		F10.4 F10.4 F10.4	1-10 11-20 1 1 71-80	PSTTBL (I,3) is the probability that the target is hull defilade (turret exposed) when at a NO-to-target range of RNGPST (I). Again, if NRNGPS>8, a second card is needed for PSTTBL (9,3) through PSTTBL (NRNGPS,3).
			14-63	

8. Invariant Data Block.

When reading invariant data in PREPMS for transfer to TAPE 11, the first card (which indicates that an invariant data record is to be read) must be of the form:

NEW RECORD, record name, 8

or

NEW REC, record name, 8

where record name is the name of the invariant data record to be read (see section 5.3.7 for invariant data record names).

When using the TEMPORARY option with COPE, the invariant data is headed by a card of the form:

TEMPORARY, INVARIANT

or

TEMP, INVARIANT

In either case (whether reading invariant data in PREPMS or COPE), the remaining cards of the invariant data are as follow:

INVARIANT	ΠΔΤΔ	CARD	SET
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Card	Mo	2	
Larg	NO.	۷.	

Variable name	UNITS	Format	columns	Description
NRNGTT		15	1-5	The number of range classes used with the LDWSS probability of hit numbers.
				NRNGTT≤ 20 with current dimensions.
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			1	
		į		
				1 1
				:
		1	14-65	
	1		1	

INVARIANT DATA ____CARD_SET

Card No. <u>3a - 3t</u>

Variable name	UNITS	Format	columns	Nescription
RNGTTF (J)	meters	F10.4	1-10	RNGTTF (J) is the Ith range at which probability of hit data is entered. RNGTTF (1) = 0.0 and
TTF (1,J,1)		F10.4	11-20	RNGTTF (I) < RNGTTF (I+1). TTF (I,J,K) is the probability of hit at range J using designator
TTF (1,J,2)		F10.4	21-30	type I against a target in posture K I = 1 for GLLD
TTF (2,J,1)		F10.4	31-40	I = 2 for MULE I = 3 for LTD
TTF (2,J,2)		F10.4	41-50	K = 1 for fully exposed K = 2 for hull defilade (turret
TTF (3,J,1)		F10.4	51-60	exposed)
TTF (3,J,2)		F10.4	61-70	There will be NRNGTT cards of this type with each card containing the same data points as its predecessor but for the next J value.
			5	There will be a maximum of 20 such cards.
		:	: !	1
			: 	:
				! ; !
				1 1 1
				:
		1	14-66	

INVARIANT DATA

__CARD_SET Card No. 4

Variable name	UNITS	Format	columns	Nescription
DLTT (1)	seconds	F10.4	1-10	DLTT (I) is the Ith response time delay value to be used in interpolating with respect to
DLTT (2)	seconds	F10.4	11-20	interpolating with respect to delay time in the PETBL array.
DLTT (3)	seconds	F10.4	21-30	DLTT (1) = 0.0 and DLTT (I) \leq DLTT (I+1).
DLTT (4)	seconds	F10.4	31-40	DETT (1) - DETT (1:1).
DLTT (5)	seconds	F10.4	41-50	
DLTT (6)	seconds	F10.4	51-60	
	6			
		į		
	1			
				•
			İ	
		1	14-67	

INVARIANT DATA ____CARD SET

Card No. 5a

Variable name	STINU	Format	columns	Nescription
PKTBL (1,1)		F10.4	1-10	PKTBL (I,1) is the probability
PKTBL (2,1)		F10.4	11-20	of kill given a Copperhead hit against target type I in a full
PKTBL (3,1)		F10.4	21-30	exposed posture,
PKTBL (4,1)		F10.4	31-40	
PKTBL (5,1)		F10.4	41-50	
PKTBL (6,1)		F10.4	51-60	1
PKTBL (7,1)		F10.4	61-70	
İ				
		1	14-68	
1		i	•	

INVARIANT DATA

__CARD SET

Card No. 5b

PKTBL (1,2) is the probabil	i +v
PKTBL (1,2) F10.4 1-10 PKTBL (1,2) is the probability of kill given a Copperhead	hit
PKTBL (2,2) F10.4 11-20 against target type I in a defilade (turret exposed)	hull
PKTBL (3,2) F10.4 21-30 posture.	
PKTBL (4,2) F10.4 31-40	
PKTBL (5,2) F10.4 41-50	
PKTBL (6,2) F10.4 51-60	
PKTBL (7,2) F10.4 61-70	
14.60	
14-69	

to PREPMS is a line of the form:

The third type of input

REPORT RECORD LIST

or

REP REC LIST

Inserting this line (card or card image) in the PREPMS input will cause the program to print a list of the names of the records on TAPE 11 at the time the line is encountered.

The usual practice is to place a line of this type in the input after all of the option word records and data block records so that the list produced will include all of the records created by the current run.

An example of the list produced is shown in Appendix C.

14.4.4 INTERPRET PEDATA Directive. The fourth type of input to PREPMS is a line of the form:

INTERPRET PEDATA

Inserting a line of this form in the PREPMS input will cause the program to print a list of the names of the current PE data records on TAPE 11 as well as the values of the nine parameters corresponding to each such record (see section 5.4).

14.5 PREPMS Output.

PREPMS writes to two files, TAPE 11 and TAPE 6 (also called OUTPUT). TAPE 11 receives the data block records, the option word records, the record named OPTNNUMS (which is automatically maintained by PREPMS with no user attention), and the record index array which is automatically maintained by the CDC word addressable mass storage file facilities. TAPE 6 (usually a line printer) is a sequential file on which PREPMS echoes the inputs that create the data block records and option name records as well as prints the lists generated by INTERPRET PEDATA and REPORT RECORD LIST directives.

A sample of PREPMS output (TAPE 6) is given in Appendix C, so further discussion is not given here.

14.6 PREPMS Diagnostic Messages.

Since several of the subroutines used by PREPMS are similar to those used in COPE, any diagnostic messages not found in this section (which gives only the PREPMS-peculiar messages) should be given in Chapter 7.

14.6.1 Messages of Informational Nature Not Terminating Program.

1. **PREPMS** NON-FATAL WARNING! YOU HAVE SEQUENCE NUMBERS IN COLS. 73-78 OF TAPES. THEY WILL BE REMOVED BY THE PROGRAM; HOWEVER, THE RESULTS MAY BE SUSPECT.

This message is generated in SEPRC2 and is caused when the computer detects editor sequence numbers in the INPUT file (see section 7.1).

This message does not stop the program; however, it is very probable that the wrong data has been used if this message is printed. Great care should be taken to assure that the OUTPUT shows the correct (intended) values and that no sequence numbers were taken as input.

Note that the sequence numbers are removed only from those lines entered in free format. All lines entered as formatted data will still have sequence numbers which may be read instead of the intended data (for columns 73-78).

To avoid this problem, one should always use an 80 character line length when editing the input file for PREPMS (i.e., F,CH=80 on CDC).

2. **PREPMS** THIS IS A CREATION RUN FOR RECORD OPTNNUMS.

This message is not really a diagnostic but merely indicates to the user that this run of PREPMS creates a new TAPE 11. If this message is not present, it means that the current PREPMS run is modifying an existing TAPE 11 rather than creating a new one.

14.6.2 STOPS With Messages in Day Files.

1. STOP IN PREPMS: ERROR NUMBER 1.

This stop occurs when the program has read an input card which should be the first card of one of the four input types of section 14.4, but does not recognize the card as one of those four types.

This error is most likely to happen when either the card is mispunched or the previous input set (especially if it was type I or type 2 input) has the wrong number of cards.

2. STOP IN PREPMS: ERROR NUMBER 2.

This error occurs when the third field of a type I card of a type I input is not a number. (That is, the option word record input type starts with a card that has a non-numeral for the value of NREAD. See section 14.4.1 for the correct form of this card type).

3. STOP IN PREPMS: ERROR NUMBER 3.

This error occurs when the fourth field of a type 1 card (the value of NOPT1) of a type 1 input is not a number. (See section 14.4.1 for the correct form of this card type).

4. STOP IN PREPMS: ERROR NUMBER 4.

This error occurs when the first field of a type 2 card of a type 1 input is not a number. Again, see section 14.4.1 for the correct form of this card.

5. STOP IN PREPMS: ERROR NUMBER 5.

This error occurs when the second field of a type 2 card of a type 1 input is not a number. See section 14.4.1 for the correct form of this card.

6. STOP IN PREPMS: ERROR NUMBER 6.

This error occurs when the third field of the first card of a type 2 input is not a number. See section 14.4.2 (subsections 1 through 8) for the proper first card form for this input type.

7. STOP IN PREPMS: PROGRAM TERMINATION.

This means that the program reached the end of a file on TAPE 5 (INPUT) without any errors detected. It is the message that accompanies a successful run, but of course it is no guarantee that the data are correct (only that they are formatted in a valid form).

8. STOP IN SEPRC2: ERROR NUMBER 1.

This stop occurs only if the number of fields on a free formatted input card is greater than 10 or less than or equal to 0.

15. PRBLOS PREPROCESSOR

The PRBLOS preprocessor is used to calculate the probability that a target randomly located along a route of approach within a certain designator-to-target range band will be in the line-of-sight of the designator for at least the final critical seconds of the COPPERHEAD trajectory.

This chapter gives: (1) the mathematical derivation of the method for computing the probability mentioned above, (2) a description of the program, (3) a glossary of program variables, (4) description of inputs, and (5) description of outputs. A program listing along with sample inputs and the resulting outputs are given in Appendix B.

15.1 Method For Calculating PRBLOS.

For a particular designator-to-target range band (e.g., ranges 2000m to 3000m) define F and G to be the cumulative distribution functions for in-view and out-of-view segment lengths respectively. That is, the probability that a randomly selected LOS segment for the given range band is of length less than or equal to X is F(X); the probability that a randomly selected out-of-view segment in the given range band is of length less than or equal to X is G(X).

Let $t_{\rm C}$ be the critical time; that is the time interval at the end of the COPPERHEAD trajectory during which the target must be designated in order for the COPPERHEAD to track and hit the target. Also, let $v_{\rm t}$ be the target velocity (target velocity is assumed constant).

Then the history of a target's exposure can be thought of as a sequence of alternating in-view and out-of-view segments. For example, the sequence f_1 , g_1 , f_2 , g_2 , f_3 , g_3 ----, h_n , where the f_i 's are in-view segment lengths forming a sample from a population of segment lengths distributed according to the cumulative distribution F, the g_i 's are out-of-view segment lengths forming a sample from a population of segment lengths distributed according to cumulative distribution G, and h_n is the last segment which is either an f_i or a g_i depending on whether the final segment is in-view or out-of-view.

Then for a particular target's exposure (i.e., in-view, out-of-view) history, one can calculate its probability of being in-view as probability target is in-view = fraction of target's path in-view =

$$\frac{\sum_{i=1}^{N} f_{i}}{\sum_{i=1}^{N} f_{i} + \sum_{i=1}^{M} g_{i}}$$

where M is equal to either N or N-l depending on whether the last segment is respectively out-of-view or in-view.

In our problem though, we do not want the probability that the target is in-view, but rather the probability that it is in-view and will remain in-view for the next t_{C} time units. This means that the target must be in an in-view segment and be at least $t_{\text{C}} * v_{\text{t}}$ distance from the end of that segment. The probability that the target is in such a location is equal to the fraction of the target's path that consists of points that are in-view and at least a distance $t_{\text{C}} * v_{\text{t}}$ from the next out-of-view segment.

For each in-view segment either (1) $f_i \le t_c * v_t$ in which case that in-view segment contributes nothing to the total path length satisfying the conditions, or (2) $f_i > t_c * v_t$ distance from the next out-of-view segment.

Therefore, we have:

probability target is in-view and at least t_c*v_t distance from next out-of-view segment =

fraction of target's path that is in-view and at least t_c*v_t distance from the next out-of-view segment =

$$\sum_{i=1}^{N} \max \{0, f_i - t_c * v_t\}$$

$$\sum_{i=1}^{N} f_i + \sum_{i=1}^{M} g_i$$

where M and N are as before and max $\{0, t_i - t_C * v_t\}$ is the length contributed by the ith in-view segment to the total path length that is in-view and at least $t_C * v_t$ away from the next out-of-view segment.

Note: max $\{0, f_i-t_c*v_t\}$ means that the ith term of the sum is to be the maximum of the two quantities 0 and $(f_i-t_c*v_t)$.

Let S_i = max $\{0, f_i-t_c*v_t\}$ then the S_i 's can be obtained by sampling f_i 's from a population with cumulative distribution F and then applying the formula S_i = max $\{0, f_i-t_c*v_t\}$. This is equivalent to sampling from a population with cumulative distribution S where:

$$S(0) = F(t_c*v_t)$$
 and
 $S(X) = F(x + t_c*v_t)$ for $x > 0$.

Hence, our probability that the target is in-view and at least $t_c * v_t$ from the next out-of-view segment can be written:

$$\frac{\frac{1}{N}\sum_{i=1}^{N} \max \{0, f_{i}^{-t}c^{*v}_{t}\}}{\frac{1}{N}\sum_{i=1}^{N} f_{i}^{+} \frac{1}{N}\sum_{i=1}^{M} g_{i}}$$

Now to obtain an overall estimate of this probability (which we call PRBLOS) we can imagine that we let our target wander back and forth over the various paths in the given range band. As this is done, $N \to \infty$ (and also $M/N \to 1$) so that

Therefore,

$$PRBLOS = \frac{M_S}{M_f + M_q}$$

is used as the probability that a vehicle randomly located in a given range band is in-view (from the designator's position) and will remain in-view for at least \mathbf{t}_{c} time units.

15.2 Description of PRBLOS Program and Glossary of Variables.

The program is extremely simple and consists of nothing but the steps required to perform the calculations described in 15.1 as well as to read the input and print the results.

The program can be summarized as four main steps:

- (1) Read the input for the next case and print it for checking purposes; if no input, stop.
- (2) Form the modified distribution (the one with cumulative distribution function S in section 15.1) and print it.
- (3) Calculate the means of the three distributions F, G, and S (i.e., M_{f} , M_{q} , M_{S}) and from that calculate PRBLOS.
- (4) Print PRBLOS and return to step (1) to see whether there is another case.

The subroutine AVEL of the program computes the mean of a distribution with cumulative distribution function F by using the formula:

$$M_{f} = \int_{L}^{U} xf(x)dx = UF(U)-LF(L) - \int_{L}^{U} F(x)dx$$

where f is the probability density function (i.e., f = F' almost everywhere) and U and L are respectively the upper and lower bounds of the distribution (in our cases, $0 \le L \le U \le \infty$).

Since F is defined in the program by an array of ordered pairs (x_i, F_i) i = 1, 2...K where F_i = probability that x is less than or equal to x_i , it is possible to approximate the right most integral by:

(*)
$$\int_{1}^{U} F(x) dx \approx \frac{1}{2} \sum_{i=1}^{K-1} (x_{i+1} - x_{i}) (F_{i+1} + F_{i}).$$

Hence, the subroutine AVEL calculates the mean of a population with cumulative distribution function F using the formula:

$$M_f = x_K F_K - x_1 F_1 - \frac{1}{2} \sum_{i=1}^{K-1} (x_{i+1} - x_i) (F_{i+1} + F_i).$$

The actual variable names used in the program are different from those used in sections 15.1 and 15.2; however, they are defined in the variable glossary so understanding should be fairly easy.

		NOTATION OF	GLOSSAR	GLOSSARY OF PRBLOS VARIABLES
VARIABLE	TYPE	BLOCK '	UNITS	DEFINITION
A(6)		(LOCAL)		The A array contains up to 60 alphamuneric characters used as a case title
AVE		(LOCAL) (F.P.)	meters	AVE is the value returned by subroutine AVEL as the mean length of the distribution with which it (AVEL) was called
AVEIV		(LOCAL)	meters	AVEIV is the mean length of the in-view segment lengths (Mp of section 15.1)
AVEIVM		(LOCAL)	meters	AVEIVM is the mean length of the modified in-view segment lengths (M $_{_{ m K}}$ of section 15.1)
AVE00V		(LOCAL)	meters	AVEOOV is the mean length of the out-of-view segment lengths (M_{α} of section 15.1)
CO		(LOCAL)	meters	CD is the critical distance; that is, the distance that the target will cover during the critical time ($t_c^*v_t$ in the notation of section 15.1)
ı		(LOCAL)		I is used as a DO-LOOP control variable and as a subscript value.
r		(LOCAL)		J is used as a DO-LOOP control variable and as a subscript value.
¥		(LOCAL)		K is used as a DO-LOOP control variable and as a subscript value.
NIV		(LOCAL)		NIV is the number of points (ie, pairs, PRIV(I,1) and PRIV(I,2) used in the current case to describe the cumulative in-view segment length distribution (NIV ≤ 20 with current program dimensions)
NIVM		(LOCAL)		NIVM is the number of points (ie, pairs PRIVM(I,1) and PRIVM(I,2) used in the current case to describe the cumulative modified inview segment length distribution (NIVM ≤ 20 with current program dimensions).
NOON		(LOCAL)		NOOV is the number of points (ie, pairs $PROOV(I,1)$ and $PROOV(I,2)$ used in the current case to describe the cumulative out-of-view segment length distribution (NOOV ≤ 20 with current program dimensions).
N.		(LOCAL)		NU is equal to one less then the number of points used to describe the cumulative distribution whose mean is being calculated by subroutine AVEL. It is the number of terms in the sum of equation (*) of section 15.2.
N.		(LOCAL) (F.P.)		Nl is the first dimension of the P array. In this program, Nl is always equal to 20.

		COMMON	GLOSSARY OF PRB	GLOSSARY OF PRBLOS VARIABLES - CONTINUED
VARIABLE	ТҮРЕ	ВГОСК	UNITS	DEFINITION
N2		(LOCAL) (F.P.)		N2 is the second dimension of the P array. In this program, N2 is always equal to 2.
N3		(LOCAL) (F.P.)		N3 is the number of points used to describe the cumulative distribution whose mean is being calculated by subroutine AVEL.
P(N1,N2)		(LOCAL) (F.P.)	P(I,2) is in meters	P(I,1) is the probability that a segment length (randomly selected from the population whose mean is now being calculated by subroutine AVEL) is less than or equal to P(I,2). (where I=1, 2,, N3).
PRBIVM		(LOCAL)		This is the variable PRBLOS of section 15.1 (Since the program card uses PRBLOS as the program name it was necessary to call the variable by another name) It is the probability that a vehicle randomly located along an approach path in the given range band is currently in view and will remain in view for at least to seconds.
PRIV(20,2)		(LOCAL)	PRIV (I,2) is in meters	PRIV is the array describing the cumulative distribution of inview segment lengths (F of section 15.1) PRIV (I,1) is the probability that a randomly chosen in-view segment is of length PRIV(I,2) or less.
PRIVM(20,2)		(LOCAL)	PRIVM(I,2) is in meters	PRIVM is the array describing the cumulative distribution of modified in-view segment lengths (S of section 15.1). PRIVM(I,1) is the probability that a randomly chosen modified in-view segment is of length PRIVM(I,2) or less.
PROOV(20,2)		(LOCAL)	PROOV(I,2) is in meters	PROOV is the array describing the cumulative distribution of out-of-view segment lengths (G of section 15.1). PROOV(I,1) is the probability that a randomly chosen out-of-view segment is of length PROOV(I,2) or less.
SUM		(LOCAL)		SUM is the value of the summation of equation (*) of section 15.2.
JL		(LOCAL)	seconds	TC is the critical time (t. of section 15.1) It is the duration of the interval at the end of the Copperhead trajectory during which the target must be (nearly) continuously lased in order that the round can track and hit the target.
TGTVEL		(LOCAL)	meters/sec.	TGTVEL ($v_{f t}$ of section 15.1) is the velocity of the target.

15.3 PRBLOS Inputs.

For each case that is to be run with the PRBLOS program, a set of input cards (or card images) composed of card types I through 5b must be prepared. Multiple cases can be run by simply stacking card sets for the various cases one after another. The first card of each case has room (columns 21 through 80) for an identifying alphanumeric string which is reproduced on output for easier case identification. The program runs all cases until it either runs out of input or encounters an illegal input value.

Since the normal use of the PRBLOS program is to calculate the values to fill the RANDOM OCCURRENCE Data Block of COPE (in particular the PRBLOS array), each case run of the PRBLOS program corresponds to a given terrain, target velocity, and range band combination. For consistency, the PRIV data for PRBLOS should be obtained from the same source as the SEGLOS data for COPE. (Indeed, there is no reason why for a given terrain the same values cannot be used for PRIV(I,1) as for SEGLOS (I,1) and for PRIV(I,2) as for SEGLOS (I,J) in the (J-1)th range band.)

TGTVEL, TC, A CARD SET

CARD NO. 1

meters/sec.	F70.4		<u> </u>
cocondo		1-10	The velocity of the target
seconds	F10.4	11-20	The critical time
	OIA	21-30	A(1) through A(6) can be used to hold up to 60 characters of case heading which are copied from this card to the first output line of each case. This has no effect on calculations but enables the user to label the cases.
	AIO	31-40	
	A10	41-50	
	OIA	51-60	
	A10	61-70	
	A10	71-80	
			15-8
		AIO AIO AIO AIO	AIO 31-40 AIO 41-50 AIO 51-60 AIO 61-70

NIV ____CARD SET

CARD NO. ____2___

VARIABLE NAME	UNITS	FORMAT	COLUMNS	DESCRIPTION
ARIABLE NAME	UNITS	I5	1-5	This is the number of points to be read to describe the cumulative in-view segment length distribution. NIV controls reading of PRIV: PRIV (I,1) for I=1,2,NIV PRIV (I,2) for I=1,2,NIV NOTE: Current program dimensions require NIV < 20.
				15-9

PRIV (I,1) CARD SET

CARD NO. 3a

VARIABLE NAME	UNITS	FORMAT	COLUMNS	DESCRIPTION	ŧ
PRIV(1,1)	•	F10.5	1-10	PRIV(I,1) is the probability that a randomly chosen in-view segment has length less than or equal to PRIV(I,2).	_
PRIV(2,1)		F10.5	11-20		
PRIV(3,1)		. F10.5	21-30	NOTE: PRIV(I,1) < PRIV(I+1,1) for	
PRIV(4,1)		F10.5	31-40	I = 1,2, NIV-1; $0 \leq PRIV(I,1) \leq 1$ for $I = 1,2,NIV;$ and	
PRIV(5,1)		F10.5	41-50	PRIV(NIV,1) = 1.0	
PRIV(6,1)		F10.5	51 -60	If NIV > 8, then an additional card (or two)	
PRIV(7,1)		F10.5	61-70	is needed for PRIV(9,1) through PRIV(NIV,1) The additional card(s) should have 8F10.4	
PRIV(8,1)		F10.5	71 -80	format also. PRIV(I,1) and PRIV(I,2) together correspond to the F_i and X_i values respectively (in the notation of section 15.2) for the in-view distribution.	
				15-10	

PRIV (I,2) CARD SET

CARD NO. 3b

VARIABLE NAME	UNITS	FORMAT	COLUMNS	DESCRIPTION
PRIV(1,2)	meters.	F10.5	1-10	PRIV(I,2) is the in-view segment length
PRIV(2,2)	meters	F10.5	11-20	corresponding to cumulative probability PRIV(I,1)
PRIV(3,2)	meters	F10.5	21-30	NOTE:
PRIV(4,2)	meters	F10.5	31-40	PRIV(I,2) < PRIV(I+1,2) for I = 1,2,,NIV-1
PRIV(5,2)	meters	F10.5	41-50	
PRIV(6,2)	meters	F10.5	51-60	If NIV-8, then an additional card (or two)
PRIV(7,2)	meters	F10.5	61-70	is needed for PRIV(9,2) through PRIV(NIV,2). The additional card(s) have 8F10.4 format.
PRIV(8,2)	meters	F10.5	71-80	oriu.4 format.
				15-11

NOOV	CARD	SET	CARD	NO.

ARIABLE NAME	UNITS	FORMAT	COLUMNS	DESCRIPTION
NOOV		15	1-5	NOOV is the number of points to be read to describe the cumulative out-of-view segment length distribution. NOOV controls reading of PROOV: PROOV(I,1) for I=1,2,NOOV PROOV(I,2) for I=1,2,NOOV NOTE: Current dimensions require NOOV < 20.
				15-12

PROOV (I,1) CARD SET

CARD NO. 5a

VARIABLE NAME	UNITS	FORMAT	COLUMNS	DESCRIPTION
PROOV(1,1)		F10.4	1-10	PROOV(I,1) is the probability that a randomly chosen out-of-view segment has length
PROOV(2,1)		F10.4	11-20	less than or equal to PROOV(I,2).
PROOV(3,1)		F10.4	21-30	NOTE:
PROOV(4,1)		F10.4	31-40	$PROOV(I,1) \le PROOV(I+1,1)$ for $I = 1,2,,NOOV-1$;
PROOV(5,1)		F10.4	41 – 50	$0 \le PROOV(I,1) \le 1.0$ for $I = 1,2, NOOV;$ and
PROOV(6,1)		F10.4	51-60	PROOV (NOOV,1) = 1.0
PROOV(7,1)		F10.4	61-70	If NOOV > 8, then an additional card(or two)
PROOV(8,1)		F10.4	71-80	is needed for PROOV(9,1) through PROOV(NOOV, The additional card(s) should have 8F10.4 format.
	•			PROOV(I,1) and PROOV(I,2) correspond to a point on the cumulative distribution G of section 15.1 (a point with coordinates (PROOV(I,2),PROOV(I,1)) in the usual notation
l				
				15-13

PROOV(1,2) CARD SET

CARD NO. 5b

VARIABLE NAME	UNITS	FORMAT	COLUMNS	DESCRIPTION
PROOV(1,2)	meters	F10.4	1-10	PROOV(I,2) is the out-of-view segment length corresponding to cumulative
PROOV(2,2)	meters	F10.4	11-20	probability PROOV (I,1).
PROOV(3,2)	meters	F10.4	21-30	NOTE:
PROOV(4,2)	meters	F10.4	31-40	$PROOV(I,2) \le PROOV (I+1,2)$ for $I = 1,2,,NOOV-1$;
PROOV(5,2)	meters	F10.4	41-50	$0.0 \le PROOV(I,2) \le 1.0$ for $I = \overline{1}, 2,,NOOV$.
PROOV(6,2)	meters	F10.4	51-60	1 - 1, 2,,11000
PROOV(7,2)	meters	F10.4	61-70	If NOOV > 8, then an additional card (or two) is needed for PROOV(9,2) through
PROOV(8,2)	meters	F10.4	71-80	PROOV(NOOV,2). The additional card(s) have 8F10.4 format.
	:			
		ļ		
			ļ	
}	Í			15-14

15.4 PRBLOS Output and Diagnostics.

15.4.1 Output. The output of the PRBLOS program is very brief and easy to understand.

For each case run, the first line of output prints the case identifier (if any). The next line prints the target velocity and critical time values. Then comes the PRIV array preceded by NIV. Next the PROOV array preceded by NOOV and the PRIVM array preceded by NIVM. Finally, it prints the average segment lengths of the three distributions and the PRBLOS value followed by the words "END OF CASE".

In the special case that t_c*v_t is greater than the longest possible in-view segment, a message to that effect is printed along with the value of PRBLOS (namely, 0.0). In this case, the PRIVM array is not printed.

Note that PRBIVM is labeled PRBLOS when printed. (This is because PRBIVM is a second choice name for PRBLOS used only because the program card name PRBLOS prevented the use of a variable PRBLOS in the program).

A program listing as well as sample input and output for PRBLOS is contained in Appendix $\ensuremath{\mathsf{B}}_{\bullet}$

15.4.2 Diagnostic ("STOP") Messages in Dayfile.

1. STOP END OF INPUT.

This message means that the program has encountered the end of file of TAPE5 (INPUT). This is the normal program termination message, but of course, it is no guarantee that the results are correct.

2. STOP NIV>20 EXCEEDS DIMENSIONS OF PRIV ARRAY.

This message means the user attempted to read in an NIV value greater than 20. It may occur because NIV is not right justified in columns 1-5 of its input card. Of course, it may also occur if NIV is really greater than 20; if this is the case, then the user must either use fewer points to describe PRIV or redimension PRIV in the program (and change N1 in first call of AVEL. Redimensioning of PRIVM and changing N1 in the third call of AVEL may also be required).

3. STOP NOOV>20 EXCEEDS DIMENSIONS OF PROOV ARRAY.

This message means the user attempted to read in an NOOV value greater than 20. It may occur because NOOV is not right justified in columns 1-5 of its input card. Of course, it may also occur if NIV is really greater than 20; if this is the case, then the user must either use fewer points to describe PROOV or redimension PROOV in the program (and change N2 in the second call of AVEL).

CHAPTER 16

16. PAM PREPROCESSOR

Unlike the other programs documented in this report (COPE, PREPMS, and PRBLOS), the PAM program was not written by the author of this report. Since the author (Michael Starks, GWD, AMSAA) of PAM will document it in a separate report, this chapter is limited to a brief explanation of the program's purpose and a description of the input. Appendix A contains a program listing as well as sample inputs and outputs.

16.1 General Description of PE Program (PAM).

The PAM program is used to compute the probability of engagement of the target by the COPPERHEAD seeker. More precisely, probability of engagement (PE) is the probability that the COPPERHEAD seeker receives enough reflected laser energy from the target for the COPPERHEAD round to initiate maneuver toward the target and that the target is within the maneuver footprint of the COPPERHEAD.

The PAM model produces a table of 4200 PE values (6 cloud ceiling altitudes x 10 meteorological visibility limits x 5 delay times x 7 designator-to-target ranges x 2 "MUTS" factors). (The multi-unit target factor ("MUTS" factor) allows TLE to be reduced when the predicted impact point is bracketed by a column of target vehicles.)

Such a table then has PE values as a function of cloud ceiling, visibility limit, delay time, MUTS factor, and designator-to-target range. In addition, the set of PE's in the table is a function of the 9 parameters mentioned in section 5.4 (namely, nominal response time, designator type (power), target velocity, gun-target range, reflectivity of target, angle T, deflection bias (distance between footprint centroid and target path point of closest approach), target heading, and seeker sensitivity). Hence, for each different combination of values of the 9 parameters a different set of PE values is needed which, in turn, requires another run of the PAM program.

The PAM program includes the code mentioned in section 5.4 that generates PE data block record names from the values of the 9 parameters. The subroutine PENAM2 is included in PAM and is identical to the PENAME subroutine in COPE and PREPMS except for the change in name and the fact that the data statement for the XVALUE array is included in PENAM2 rather than in a separate BLOCK DATA subprogram as in COPE and PREPMS. The error stops with messages produced by PENAM2 correspond to those for PENAME as explained in section 7.5.

Assuming that the user runs PAM with values of the 9 parameters that are permitted by PENAME (see section 5.4 and discussion of XVALUE array), then a PE DATA record name is generated. The PE values are loaded in the arrays PE (for writing to TAPE 11 as a PE data record for use by COPE) and PENG (for writing to TAPE 6 (output) to provide a hard copy of the PE values).

In order that the values written to TAPE 11 are accessible by COPE, of course, it is necessary to catalog TAPE 11 and use it with the COPE runs. The interface between PAM and COPE has been covered in section 5.4.

The output of PAM consists mainly of the inputs which are echoed for checking purposes (some of the angles are converted to radians before being printed). The PE values are printed in 70 groups of 60 (6 cloud ceiling altitudes, 10 visibility limits) with each group corresponding to a particular designator-to-target range, time delay, and MUTS factor combination.

A program listing together with sample inputs and outputs is included in in Appendix A.

16.2 PAM Inputs.

The PAM program takes all its inputs in free format (in CDC terminology, it uses list-directed reads). This means that on each card in the following description that takes more than one variable, the values of the variables are punched one after another with commas between successive values. (See sample input in Appendix A).

IMF CARD SET

CARD NO. ____1____

ARIABLE NAME	UNITS	FORMAT	COLUMNS	DESCRIPTION
IMF		Free		Mission type flag IMF = 1 for preplanned target
				IMF = 2 for target of opportunit
		16-3		

ETH CARD SET CARD NO. 2

VARIABLE NAME	UNITS	FORMAT	COLUMNS	DESCRIPTION
ЕТН	Joules/km ²	Free		ETH is the energy threshold. That is, the amount of energy/ area that must reach the seeker to initiate maneuver.
		16-4		

AOF CARD SET CARD NO. 3

/ARIABLE NAME	UNITS	FORMAT	COLUMNS	DESCRIPTION
AOF	Degrees	Free		AOF is the angle of fall of the COPPERHEAD round (measured from the horizontal).
		16-5		

TH,PCA CARD SET

CARD NO. 4

ARIABLE NAME	UNITS	FORMAT	COLUMNS	DESCRIPTION
ТН	Degrees	Free		Target heading. The angle between the gun-to-target line and the target path when measured counter-clockwise from the gun-target line.
PCA	Degrees	Free		Point of closest approach (deflect bias). This is the distance between the footprint centroid and the clospoint on the target's path to the centroid.
		16-6		

AZDT, V, RHO, ED, TR CARD SET

CARD NO. 5

VARIABLE NAME	UNITS	FORMAT	COLUMNS	DESCRIPTION
AZDT	Degrees	Free		AZDT is the angle T (that is, the angle between the designator-targe line and gun-target line measured counter-clockwise from the guntarget line.)*
٧	Meters/Sec	Free		V is the target velocity.
RHO		Free		RHO is the target's reflectivity.
ED	Millijoules	Free		Designator energy.
TR	Seconds	Free		Nominal respone time (time from D0's call for fire to expected round arrival. It includes time-of-flight in this case. *Note: AZDT is the nominal angle T; that is, the angle between th designator-target line and the g target-line when TR seconds have passed since D0's call for fire.
		16-7		

NK, RNG, ACCX, ACCY CARD SET CARD NO. 6

VARIABLE NAME	UNITS	FORMAT	COLUMNS	DESCRIPTION
NK		Free		NK is the Monte Carlo sample size used in the program.
RNG	Meters	Free		Gun-to-target range (must be the range for which footprints are supplied).
ACCX	Meters	Free		ACCX is the COPPERHEAD total delivery error standard deviation in the deflection direction.*
ACCY	Meters	Free		ACCY is the COPPERHEAD total delivery error standard deviation in the range direction.*
				*Note: These are the delivery error standard deviations for unguided COPPERHEAD.
		16-8		

IDRMN, IDRMX, IVMX CARD SET

CARD NO. 7

VARIABLE NAME	UNITS	FORMAT	COLUMNS	DESCRIPTION
IDRMN	Km	Free		Minimum designator-to-target range.
IDRMX	Km	Free		Maximum designator-to-target range.
IVMX	Km	Free		Maximum visibility range.
			-	
		16-9		

NI CARD SET

CARD NO. 8a

VARIABLE NAME	UNITS	FORMAT	COLUMNS	DESCRIPTION
NI(J)		Free		NI(J) is the number of points used to describe the maneuver footprint for the Jth altitude.
				J = 1 for highest altitude 2 for second highest altitude
				6 for lowest altitude
				The six altitudes for which footprints are entered are the six altitudes used for cloud ceiling altitudes in COPE weather data.
				Note that there will be a set of cards 8a, 8b, 8c for each footpr for a total of six such sets in They must be input in order of ascending J's.
				With current dimensions NI(J) ≤ 11 for all J.
		16-10		

THEMH CARD SET

CARD NO. 8b

VARIABLE NAME	UNITS	FORMAT	COLUMNS	DESCRIPTION
THEMH(1,J)	degrees	free		THEMH(I,J) is the angle used to represent the Ith point on the boundary of the Jth
THEMH(2,J)	degrees	free		footprint.
THEMH(3,J)	degrees	free		Note that the Jth footprint is represented by a set of points $\{(\rho_i, \theta_i)\}$ in polar coording
THEMH(4,J)	degrees	free		ates, where 0; = THEMH(I,J)
THEMH(5,J)	degrees	free		$\rho_i = DISMH(I,J).$
THEMH(6,J)	degrees	free		THEMH(1,J) = 0.0
THEMH(7,J)	degrees	finee		THEMH(NI(J), J) = 180.0 The angles are measured off the ray in the positive range direction from the centroid
THEMH(8,J)	degrees	free		of the footprint.
THEMH(9,J)	degrees	free		
THEMH(10,J)	degrees	free		
THEMH(11,J)	degrees ,	free		Because the footprint is symmetric about the range axis, only one half of it is read in. It is for this reason that the THEMH(I,J) values do not exceed 180 degrees. Also note that THEMH(I,J) < THEMH(I+1,J) for I = 1,2,,NI(J) - 1 If NI(J) < 11, then only NI(J) entries occon this card rather than the 11 entries shown.
			16-11	

OISMH CARD SET

CARD NO. 8c

ARIABLE NAME	UNITS	FORMAT	COLUMNS	DESCRIPTION
DISMH(1,J)	meters	free		OISMH(I,J) is the distance from the
DISMH(2,J)	meters	free		centroid to the Ith point on the boundary of the Jth footprint.
(L,E)HMZID	meters	free		
DISMH(4,J)	meters	free		
DISMH(5,J)	meters	free		
DISMH(6,J)	meters	free		
DISMH(7,J)	meters	free		
DISMH(8,J)	meters	free		
DISMH(9,J)	meters	free		
(L,Of)HMZID	meters	free		
DISMH(11,J)	meters	free		If NI(J) < 11, then this card will have only NI(J) entries rather than the 11 shown.
			16-12	

APPENDIX A

LISTING AND SAMPLE CASE OF PAM

APPENDIX A

LISTING AND SAMPLE CASE OF PAM

This appendix contains:

- (1) A listing of the FORTRAN code for the PAM program. In addition to the routines in this listing, PAM also uses the function URAN31 which is included in the COPE listing in Appendix D.
 - (2) Three sets of sample case input for PAM.
- (3) Three sample runstreams for PAM (one corresponding to each set of sample input).
- (4) Sample output created by running PAM with the first set of sample input.

Note: The column numbers included in some of the listings in this appendix are not a part of the program code, the data, or the output, but are provided only for the reader's convenience.

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                                                                                                                                                                                                 DIMENSION ACQ(6,6), H(6), TOT(6), INDEX(6,5,2), PE(60,10,7), AHTX(4260), INDXII(2001), THEMHI(11), TOT2(6,10), OISHH(11,6), IN(6), LKUP(7,5,2), PENG(70,10,6), GAMAPY(11), DTE(5)
PRIGRAN PAM (INPUT, OUTPUT, TAPES=INPUT, TAPE6=OUTPUT, TAPE7, TAPF11)
                                        THIS VERSION OF PAM IS COMFIGURED FOR USE AS A PREPROCESSOR FOR COPE. HAKE THESE CHANGES FOR STAND-ALONE PUNS:

1. DELETE CALL TO DEHMAS (FIRST EXECUTABLE STATEMENT)

2. DELETE CALL TO PEHMAS

3. DELETE CALLS TO WRITHS AND CLOSMS

4. DELETE SURP'UNITHE PEHANZ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       H ARRAY HOLDS ALTITUDES FOR WHICH ACQUISITION IS CHECKED DATA H /1372.0, 914.0, 762.0, 610.0, 457.0, 304.0/
                                                                                                                                                                                                                                                                                                                EQUIVALENCE (AMTX(1), INDEX(1)), (AMTX(61), PE(1))
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DATA IRN2 / 124.567/
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READ (5,*) AZDT,VPHO,EO,TR
WRITE (6,350) AZDT,V,PHO,ED,TR,AOF
WRITE (6,340) TH,PCA
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IF (ED.Eq.,14) IDSG=2
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LISTING A-1 FORTRAN LISTING OF PAM PROGRAM

(PAGE 1 OF 11)

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WRIT	KEAU (SE*) IDRAMSIURMXSIVAX WRITE (6,370) IDRAMSIDEMX.IVAX	038380	PR-PAM	5 6	
DO 1	DO 110 Ja1.6	038400	PP-PAM	3 5	
P.E.AD	READ (5,*) NI(J)	038410	PP-PAM	29	
≖C IN	NI J= / II ()	038420	PR-PAM	63	
WRIT	WRITE (6,390) J, MI(J)	038430	PR-PAM	49	
READ	READ (5, *) (THEM! (1, J)) I = 1, HIJ)	038440	PR-PAM	65	
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WP.IT	WRITE (6,410) Incode, IDCODE	038530	PR-PAM	74	
WP. IT	E (6,420) V, TR, ED, RIIO	038540	PR-PAM	75	
		038550	PR-PAM	2. 2.	
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200	DO 240 IDE#IDEMX	038580	PP-PAM	2 2	
RD=F	RD=FLOAT (IDR)	03820	PR-PAM	90	
D0 2	DG 230 IV=1,IVMX	038600	PR-PAM	18	
2 00	20 IDELT=1,5	038610	PR-PAM	82	
DT≠D	01 = 01S(IDELT)	038620	PR-PAM	93	
		038630	PP-PAM	94	
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		038690	PR-PAM	06	
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PCAX	PCAX*PCA*COS(TH)	038710	PP-PAM	26	
PCAY	PCAY*PCA*SIN(TH)	038720	PR-PAM	63	
	CUMPULE LARGEL COURDINATES FOR GIVEN DELAY/VELOCITY	038730	PR-PAM	46	
BIAS	BIASX*PCAX+(SIN(TH)*V*DI)	038740	PR-PAM	95	
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TLEY	TEX#TINGY+81867	038840	DR-DAM	102	
1	SAMPLE BALLISTIC ACCURACY	038850	PP-PAM	106	
CALL	CALL HBAH31 (5X1, 5X2, 1PH2)	038860	PP-PAM	107	
BIPY	BIPY=SX1*ACCY	038870	PP-PAM	108	
RIPX	BIPX=SX2*ACCX	038880	PR-PAM	109	

LISTING A-1 FORTRAN LISTING OF PAM PROGRAM - CONT'D

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                                                                                                                                                                                                                                                                                                                                                                                                                                                                   ACQ(IC,IA)=ACQ(IC,IA)/FLOAT(MK)
TOT(IC)=TOT(IC)+ACQ(IC,IA)
WRITE(6,102)(H(IC),IC=1,6),(H(IA),(ACQ(IC,IA),IC=1,6),IA=1,6)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        INDEX RESULTS FOR COPF INTERFACE AND FOR TAPES OUTPUT
                                                                                                                                            RSSSQRT((XINT-TLEX)**2,+(YIHT-TLEY)**2,+H(IA)**2,)
RS=RS/1000,0
TS=EXP((-GAM*RS)*(1,-EXP(-,00025*HS))/(,00025*HS))
TFACT-COS(AHGSUH)
TFACT-S(ED*TD*TS*RHOFTFACT)/(PI*PS*RS)
IT (ETH.GT.ES) GH IN 130
                                                                                                                                                                                                                        MANUEVERABILITY FOOTPRINT DISTANCE COMPAPISON
                                                                                                                                                                                                                                                                                                                                                                                                                                    ACCUMULATE RESULTS OVER CFILING AND ALTITUDE
                                                                                                                                                                                                                                        TANG=ABS((TLEY-BIPY)/(TLEX-RIPX))
BETA=ATAN(TANG)
BETA=1.5708-8ETA
IF (TLEY,LT.BIPY) BETA=3.1416-BFTA
DIST=SORT((TLEX-LIPX)**Z.+(TLFY-BIPY)**Z.)
NIJ=NI(IA)
DI 120 J=1.9HIJ
THEHHI(J)=THEMH(J,IA)
DISMHI(J)=DISHH(J,IA)
OISHHIU
                                                                                                                                                                                                                                                                                                                                              CALL DVDINT (BETA, HDIS, THENHI, DISMHI, NIJ, 2)
IF (DIST, GT, HDIS) GO TO 130
ACQ(IC, IA) = ACQ(IC, IA) + 1.0
GO TO 140
130 CONTINUE
140 CONTINUE
150 CONTINUE
         AQUISITION VOLUME ENERGY COMPARISON
                                                                                                   AMGSUH=(AZDT*,01745320252)+ALPHA
GAM=GAMARY(IV)
TD=EXP(-GAM*RD)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           00 170 II=1,6
JPE=10*(II-1)+2*(IDELT-1)+IMTS
IMDEX(II,IDELT,IMTS)+JPE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    WRITE(6,100) (TOT(IC),IC=1,6)
                                          DU 130 IA=IC,6
YINT=-H(IA)*COT(AUF)+BIPY
                                                                                             ALPHA=ATAN2(X,Y)
                                                                                                                                       HS=(H(IA)*3.28)
                                                                                                                                                                                                                                                                                                                                                                                                                                                00 160 IC=1,6
                                DO 140 IC=1,6
DU 130 IA=IC,
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                                                                        X=(TLEX-XINT)
Y=(TLEY-YINT)
                                                               XINT=8IPX
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LISTING A-1 FORTRAN LISTING OF PAM PROGRAM - CONT'D

(PAGE 3 OF 11)

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1 TR= ,F7.2,6H ADF= ,F5.2)
360 FORMAT (1H ,5H HK= ,16,6H PHG= ,F10.1,6H ACCX=,F6.2,8H ACCY = ,F6.039940
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310 FORMAT (FIL2.8)
320 FORMAT (FIL2.8)
330 FORMAT (1H ,4HETH=,FIL2.8)
330 FORMAT (1H ,4HETH=,FIL2.8)
340 FORMAT (1H ,24H TARGET HEADIHG ANGUF = ,F5.2,13H PT CUS APP= ,F7.2039900
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370 FORMAT (111,6011fpHH=,14,811 IDPMX=,14,711 IVMX=,14)
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WRITE (IUNIT,450) ((INDEX(I,J,K),K=1,2),J=1,5)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   * * * FORMAT STATEMENTS * * *
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        (IUNII, 460) ((PE(I, 1, 2, 1, 1, 7), 3=1, 10)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  CALL WRITHS (11,4MTX,4260, Ircnpc,-1,0)
CALL CLOSHS (11)
STOP 'IN PAH: HOPMAL PROGPAM TFPNIMATION
PE(JPE,IV,IPR)=TOT(II)
DO 1R0 II=1,6
LFE=10*(IOR-1)+2*(IDELT-1)+IMTS
LKUP(IDR,IDF-L',IMTS)=IPF
PEHG(IPE,IV,II)=TOT(II)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               (IUNIT.EQ.7) GN TN 290
                                                                                             00 100 IC=1,6
TOT2(IC,IV)=TOT(IC)
CONTINUE
                                                                                                                                                        DU 200 IC=1,6
DU 200 IA=1,6
ACQ(IC,IA)=0.
TUT(IC)=0.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       00 280 I*1,60
WRITE (111)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      60 TO 260
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           C DNT 1 HUE
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                                                                                180
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(PAGE 4 OF 11)

LISTING A-1 FORTRAN LISTING OF PAM PROGRAM - CONT'D

COLUMN NUMBERS (READ VERTICALLY) PR-PAM 218
PR-PAM 219
PR-PAM 220
PR-PAM 222
PR-PAM 223
PR-PAM 223
PR-PAM 225
PR-PAM 225
PR-PAM 225
PR-PAM 225
PR-PAM 227
PR-PAM 227 380 FORMAT (IH *12)ITHEM!(I**J)= /(L2F10*1))
390 FORMAT (IH0,5H J= *14,9H MI(J)= *14)
390 FORMAT (IH0,5H J= *14,9H MI(J)= *14)
400 FORMAT (IH *10) IDSMH(I**J)=/(L1F10*1))
410 FORMAT (IH *10) VELOCITY=*F(4.2*16H MEAN RESP TIMF=*F7.2*18H DESIGNO40010
420 FORMAT (IH *10) VELOCITY=*F4.2*16H MEAN RESP TIMF=*F7.2*18H DESIGNO40010
430 FORMAT (IH *10) IARGFIS SIGNATIN PANGE=*I4*13H DELTA TIME=*F8.4*2*040030
440 FORMAT (EF10.5)
450 FORMAT (EF10.5)
460 FORMAT (Z110)
460 FORMAT (Z110)
460 FORMAT (Z110)
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COLUMN NUMBERS (READ VERTICALLY)

LISTING A-1 FORTRAN LISTING OF PAM PROGRAM - CONT'D

(PAGE 5 OF 11)

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SP-DVDIN32
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SR-DVDIN34
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SR-DVDIN36
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SR-DVDIN39
SR-DVDIN40
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SR-DV0IN42
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SR-DVDIN45
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SR-DVDIN47
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SR-OVDIN52
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                                                                                                                                                                                                                                                                                                                 (X-2, *XT(1) +XT(2)) 240,240,120
(X-2, *XT(4P)+XT(4P-1)) 130,130,240
(MP.LT.10) 67 TG 150
SUBROUTHE DVDINT (X,FX,XT,FT,NP,HD)
DIMENSION XT(NP), FT(NP), T(LA)
N=ND
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     [(I)=(T(I+1)-T(I))/(XT(N8)-XT(N5))
                                                                                                                                                                                                                          IF (XT(1)-XT(2)) 110,330,260
CONTINUE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       240 WRITE (6,340) X,XT(1),XT(NP)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        (XT(H6).LT.X) H4=N6
(N5.GT.1) GD TD 140
(X-XT(N4)) 180,160,160
(H4-N3) 170,180,170
                                                                                                                                                          N3=NF-H2+1
IF (NP-N) 250,100,100
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               GN TO (210,220), JH
UN=UN*(X-XT(H6))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                6H TH 230
UN=UN*(X-XT(N7))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               DO 200 I=1,N3
N8=N5+J
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           DO 230 J=1,N2
N5=N4-N1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    TR = TP+UN*T(L)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      DO 190 I=1,N
                                                                                          N1=(N-1)/2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                N5=N5+1
L=(N+1)/2
TR=T(L)
N6=N4
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            TO 150
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             15=N4-N1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         60 TO 1
180 N4=N4-1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 N7=N4+1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                N7=N7+1
                                                                                                                                                                                                                                                                                                                                                                                                                     N5=NP-1
                                                                                                                                                                                                                                                                                                                                                                                                                                                  N5=N5/2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      N6=N6-1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              112=11-1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          RETURN
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        N3=N-J
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          FX=TI
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160
170 h
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LISTING A-1 FORTRAN LISTING OF PAM PROGRAM - CONT'D

(PAGE 6 0F 11)

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SP-0V01N57
SP-0V01N58
SP-0V01N69
SP-0V01N61
SP-0V01N62
SP-0V01N65
SP-0V01N65
SP-0V01N65
SP-0V01N65
SP-0V01N65
                                                                                                                                                                                                                                                        SR-0V01N75
SR-0V01N76
SR-0V01N77
SR-0V01N78
SR-0V01N79
                                                                                                                                                                                                                                   SR-0V0IN73
SR-0V0IN74
                                                                                                                                                                                                              SR-0V0IN71
SR-0V0IN72
                                                                                                                                                                                                   SR-0V0IN70
                                                                                                                                                                                        SR-0V0IN69
                                                                                                                                                                              SR-0V0IN68
                                  040640
040650
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                                                                                                                                                                                                                                                                                             040860
                                                                                                                                                                                                                                                                                                                   040880
                                                                                                                                                                                                                                                                      340 FORMAT (23H ARG, NOT IN TABLE X= ,E14.7,9H XT(1)= ,E14.7,10H (1NP)= ,E14.72.5,10UNINT)
250 FORMAT (22H TABLE TOO SHALL HP= ,15,6H NO= ,15,2X,6HOVOINT)
360 FORMAT (23H CHYSTAIT TARLE XT(1)= ,E14.7,2X,6HOVOINT)
                                                                                                                                                                                                                                                  STATEMENTS ***
                                                                 260 JF (X-2.*XT(1)*XT(2)) 270,240,240
270 JF (X-2.*XT(NP)*XT(NP-1)) 240,280,280
280 JF (HP.LT.10) 60 TO 300
N5=NP-N
                                                                                                                                         IF (XT(N6), GT, X) H4=N6
IF (H5, GT, 1) GU TH 290
300 IF (X-XT(N4)) 310, 310, 180
310 IF (N4-N3) 320, 180, 320
                                                                                                                                                                                                  330 WPITE (6,360) XT(1)
STOP
                                     STOP
250 WRITE (6,350) HP,HD
                                                                                                                                                                                                                                                  *** FORMAT
                                                                                                                     290 N5=N5/2
                                                                                                                                                                                           320 N4=N4+1
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LISTING A-1 FORTRAN LISTING OF PAM PROGRAM - CONT'D

(PAGE 7 OF 11)

		040930 SP-NRAN314				
SUBROUTINE HRAHBI (X1, X2, I)	X3=SORI(-Z.0*ALMG(URAN31(I)))	X4=6.56318530/Z*(IPAH31(I)	XZ=X3=X11(X4)	X1=X3*(US(X4)	KE LUPA	ETIU

LISTING A-1 FORTRAN LISTING OF PAM PROGRAM - CONT'D

(PAGE 8 OF 11)

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77777 15678
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56666 56789
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55556 57890
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33333 34567
2333
22222 45678
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	_	DT+XVALUE3 DT+XVALUE3				01+XVALU10		DT+XVALU13		DT+XVALU16				DI+XVALUZI O DI+XVALUZZ		0 DT+XVALU24			_	O DI+XVALUZY			0 DT+XVALU33			0 U1+XVALU3/ 0 D1+XVALU38	•	O SR-PENAMIO		-			O SP-PENAMI7		O SR-PENAM19	777888888888 COLUMN NUMBERS
041000	001100 041030 041040	001610	001640	001660	001680	001690	001710	001720	001740	001750	001760	001780	001790	001800	001820	001830	001840	001860	001870	001880	00100	001910	001920	001930	001020	001960	041060	041070	041090	041100	041110	041120	041130	041150	041160	177777
		* *									6., 8.,			2*0.	2*8.,						SEEKER SENSITIVILLES Entinging caph chitaths faire seekep sensitivity values To	AVOID INCLUDING CLASSIFIED NUMBERS IN THE PROGRAM LISTING.	SHOULD BE PESTORED WHEN PUBLING IN A SECURE	DONE WITH THESF FALSF VALUES ARE FUR EXAMPLE												9888899
		*	/ (6	Ci.				3*0.9	3#8.3	10.,				120.	5.1	: ;	3*0*2	340.0	3*0.5	3*8.	S SENS	HE PROC	HEN PUR	F VALUE	3*0.9	3*8./										447777
		BLUCK	21, 1=1,	11 121				6.6	5 • •	4.0%	. .,	4*0.3	4.8.5	• 00	4.9		200.	•	6000	4.3	FAFFE	PS IN T	TORED W	SF FALS	72.,	4.9										177777
	12,6	E COMMON	8),K=1,	Al ResPu		540.9	0+0	8.,	5.3	30.,	3.,	.30,	3.,	***		;	100.		30.9	3.,	PIC FAIS	D NUMBE	BE P.ES	ITH THE	60.9	3.,										
	COMMON /XVALUE/ XVALUE(8,9,2) DIMEHSION AVALUF(9), NP(9)	FILL IN XVALUE COMMON BLOCK	DATA (((XVALUE(1, J, K), 1=1, R), K=1, 2), J=1, 9)	TIR FIORIEN	PES	÷.	1., ITIES	5.,	1.,	20.0	٠٠ ٢	.20		30.		IASES		4.2 NGS		2.,	LIVILLES PO CONTAI	CLASSIFIE	FS SINUL		48.9	2.,										
	KVALUEZ X 1 AVALUF(KVALUE (I.	SLOTS F	DESIGNATOR TYPES	2.3	1., 1., 1., FT VELOCITIES	3.5	0., 0., 1., 1., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0	12.,	0.9 1.9	.10,111		ES T		DEFLECTION BIASES	•	O., I., I., IAAAAAAAAAAAAAAAAAAAAAAAAAAAA	30.	1.9	SEEKER SENSITIVITIES	SUITED	THE CORRECT VALUES	ENT. RU	36.9	1.,)=TP.)=IDT)= (E)=REFL	AVALUE (6) = ANGLET)=DEFB)=SKSEN		
IDCODE)	OMMON /X	* * *)ATA ((()	8*0*8	DESIG	1.,	TARGET	2.,	0 0	8	0	.05,	0	ANGLES		DEFL					SEEK		THE CORR	ENVIRONMENT.		••		AVALUF(1)=TP	AVAL UE (2) = IDT	AVAL UE (5) = VI. L	AVALUE (5)=REFL	AVAL UE 16	AVAL UF (7) = DE FB	AVALUE (9)=5KSEN		
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LISTING A-1 FORTRAN LISTING OF PAM PROGRAM - CONT'D

(PAGE 9 OF 11)

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SR-PENAMES
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SP-PENAM34
SP-PENAM35
SP-PENAM36
SP-PENAM37
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SR-PENAM42
SP-PENAM43
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                                                                                                                                                                            IF (TP.LE.O.O.OR.TP.GE.9995) STOP ' IN PENAM2: ERROR NUMBER 3 '
                                                                                                                                                                                                                                                                                                                                                                                                                                                        If (ABS(FLOAT(AP(J))-XVALUE(I, J, 2)).GT..0001) GD TO 150
AVALUE(J)=XVALUF(I, J, J))
                              DO 110 J=2,9
OO 100 I=1,n
IF (A8S(AVALUE(J)-XVALUF(I,J,I)).GT..0001) GO TO 100
NP(J)=XVALUE(I,J,2)+.5
GO TO 110
                                                                                                                                DO 120 J=2,0
IF (NP(J).GE.8) STOP • IN PFNAM2: EPPOR NUMBER 2
120 CONTINUE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    4
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         STOP ' IN PENANZ (PELDHI): ERROP NUMBER
CONTINUE
                                                                                                 ٦
                                                                                          STOP ' IN PENANZ: ERROR NUMBER
110 CONTINUE
                                                                                                                                                                                                                                           EUCODE (10,170,IPCODE) NCODE
                                                                                                                                                                                                                                                                                                                                  DECROE (10,180, Inchne) Honne
                                                                                                                                                                                                                                                                                                                                                      DO 140 J=2,9
MP(11-J)=NOO(HCODF,8)
NCOOE=NCODE/8
COMTINOE
                                                                                                                                                                                                           DO 130 J=2,9
NCODE=8*NCODE+NP(J)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              VEL= AVALUE (3)
GTR= AVALUE (4)
RFFL * AVALUE (5)
AMGLET= AVALUF (6)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   AVALUE (1) = NCODE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           DEFE=AVALUF(7)
                                                                                                                                                                                       NCOOF= TR+.50
                                                                                                                                                                                                                                                                                                             ENTRY PEIDNT
                                                                                                                                                                                                                                                                                                                                                                                                                                   00 160 J=2,9
00 150 I=1,8
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     IDT = AVALUE (2)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          TR=AVALUE(1)
                                                                                                                                                                                                                                                                                                                                                                                                              NP (1)=NCODE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                              GO TO 160
CONTINUE
                                                                                      CONTINUE
                                                                                                                                                                                                                                                                 RETURN
                                                                                      100
                                                                                                                                                                                                                      130
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         150
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LISTING A-1 FORTRAN LISTING OF PAM PROGRAM - CONT'D (PAGE 10 OF 11)

SP-PENAM74
SP-PENAM75
SP-PENAM76
SP-PENAM76
SR-PENAM78
SR-PENAM79
SR-PENAM81
SR-PENAM81
SR-PENAM82
SR-PENAM82
SR-PENAM83 041710 041720 041730 041740 041750 041760 041780 041780 *** FURMAT STATEMENTS *** 170 FORNAT (4HPE00,R6) 180 FORMAT (4X,P.6) END TGTHD=AVALUE(8) SKSFM=AVALUE(9) RETURN ں

LISTING A-1 FORTRAN LISTING OF PAM PROGRAM - CONT'D

(PAGE 11 OF 11)

LISTING A-2A SAMPLE INPUT SET 1 FOR PAM

LISTING A-2B SAMPLE INPUT SET 2 FOR PAM

LISTING A-2C SAMPLE INPUT SET 3 FOR PAM

JOB CARD. CHANGE THIS CARD TO CONFORN TO INSTALLATION USAGE.
ACCOUNT CARD. CHANGE THIS CARD TO COMPORN TO INSTALLATION USAGE.
COMMENT. THIS RUNSTREAM IS USED WITH THE FIRST RUN OF THE PAM PROGRAM;
COMMENT. THAT IS, THE RUN IN WHICH TAPELI IS FIRST CREATED.
COMMENT. THE IS, THE RUN IN WHICH TAPELI IS FIRST CREATED.
COMMENT. THE LET STATEMENT DECLARGES TAPES TO BE A FILE OF RECORD
COMMENT. SA FILE FROM THE "FRONT FNO" COMPUTE ON WHICH THIS
COMMENT. JOB IS TO BE RUN.
FILE, TAPES, TATEMENT STATEMENT OBTAINS A COPY OF THE PAM INPUT ROUN THE
COMMENT. "FRONT FNO" COMPUTER AND PUTS IT IN THE LOCAL FILE TAPES.
COMMENT. "FRONT FNO" COMPUTER AND PUTS IT IN THE LOCAL FILE TAPES.
COMMENT. "FRONT FNO" COMPUTER AND PUTS IT IN THE LOCAL FILE TAPES.
COMMENT. "FRONT FNO" COMPUTER IN A TACHES THE MACHINE LANGUAGE ("BUJECT COMMENT. FOR THE NEXT STATEMENT ATTACHES. THE MACHINE THE CODE.") CREATED BY RUNHING THE PAM SOURCE CODE THROUGH THE COMMENT. FOR THE FILE WHOSE LOCAL NAME IS TAPELIA.
COMMENT. FOR THE FILE WHOSE LOCAL NAME IS TAPELIA.
COMMENT. FOR THE FILE WHOSE LOCAL NAME IS TAPELIA.
COMMENT. THE NEXT STATEMENT LOADS AND EXECUTES THE PAM PROGRAM USING COMMENT. THE NEXT STATEMENT CALLOS TAPELIA.
COMMENT. THE NEXT STATEMENT CATALOSS TAPELIA AS A PERMANENT FILE.
COMMENT. THE NEXT STATEMENT CATALOSS TAPELIA AS A PERMANENT FILE.
COMMENT. THE NEXT STATEMENT CATALOSS TAPELIA AS A PERMANENT FILE.
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COMMENT. THE NEXT STATEMENT CATALOSS TAPELIA AS A PERMANENT FILE.
COMMENT. THE NEXT STATEMENT CATALOSS TAPELLA AS A PERMANENT FILE.
COMMENT. THE NEXT STATEMENT CATALOSS TAPELLA AS A PERMANENT FILE.

LISTING A-3A SAMPLE RUNSTREAM 1 FOR PAM

JOB CAPD. CHANGE THIS CARD TO CONFORM TO INSTALLATION USAGE.
COMMENT. THIS PURISPEAN IS USED WITH PUNS OF THE PAH PROGRAM MADE AETED
COMMENT. TAPE 2 WITH SO USED WITH PUNS OF THE PAH PROGRAM MADE AETED
COMMENT. TYPE Z WITH SO CHARACTER LINES. THIS IS PROUIRED SINCE TAPES
COMMENT. TYPE Z WITH 30 CHARACTER LINES. THIS IS PROUIRED SINCE TAPES
COMMENT. TYPE Z WITH 30 CHARACTER LINES. THIS IS PROUIRED SINCE TAPES
COMMENT. THE NEXT STATEMENT OBTAINS A COPY OF THE PAM INDUT FROM THE
COMMENT. DEFAULT FILE TYPE EPOM THE "BACK END" COMPUTER ON WHICH THIS
FILE TAPES, PT = 2, FL = NO, STEPPENT
COMMENT. THE NEXT STATEMENT OBTAINS A COPY OF THE PAM INDUT FROM THE
COMMENT. THE NEXT STATEMENT ATSAMPLYER, STEPA.
COMMENT. THE NEXT STATEMENT ATTACHES THE MACHINE LANGUAGE ("OBJECT
COMMENT. FORTAM COMPLIER IN A PREVIOUS JON.
COMMENT. FORTAM COMPLIER IN A PREVIOUS JON.
COMMENT. THE HEXT STATEMENT ATTACHES THE AADEANY EXISTING TAPE II ("COPE
COMMENT. THE NULTI-READ OPTION IS TURNED OF SO THAT THE FILE CAN
ATTACH, GOAP SETTING THE NULTI-READ OPTION IS TURNED OF SO THAT THE FILE CAN
ATTACH, FORE AND THE ATTACHES THE MADEANY THE FILE CAN
ATTACH, FARE ASSET FILE NULL HE EXTENDED AND EXECUTES THE PAM PROGRAM USING
COMMENT. THE NEXT STATEMENT LOADS AND EXECUTES THE PAM PROGRAM USING
COMMENT. THE NEXT STATEMENT LOADS AND EXECUTES THE PAM FROGRAM USING
COMMENT. THE NEXT STATEMENT EXTENDS TAPELL. THIS HEAMS THAT THE PERMANENT
COMMENT. THE NEXT STATEMENT EXTENDS TAPELL. THIS HEAMS THAT THE PERMANENT
COMMENT. THE FILE THAT WAS ATTACHED UNDER LOCAL FILE NAME TAPELL.
COMMENT. THE FILE THAT WAS ATTACHED UNDER LOCAL FILE NAME TAPELL.

LISTING A-3B SAMPLE RUNSTREAM 2 FOR PAM

JOB CARD. CHANGE THIS CARD TO CONFORM TO INSTALLATION USAGE.
ACCOUNT CARD. CHANGE THIS CARD TO CONFORM TO INSTALLATION USAGE.
ACCOUNT CARD. CHANGE THIS CARD TO CONFORM TO INSTALLATION USAGE.
COMMENT. THE LAND LAND REEN CREATED. THE PAY PROGRAM WADE ATTECTORY
COMMENT. THE NEXT STATEMENT DELEASES TAPES TO BE A FILE OF RECORD
COMMENT. TYPE Z WITH SO CHARACTER LINES. THIS IS REQUIRED SINCE TAPES
COMMENT. DEFAULT FILE FROM THE "ERMIT EHD" COMPUTER WHICH THIS
COMMENT. JOB IS TO BE RUN.
FILE TAPES, FRIZZ, FLESO, BT.C.
COMMENT. JOB IS TO BE RUN.
COMMENT. THE NEXT STATEMENT OBTAINS A COPY OF THE DAM INPUT EROM THE
COMMENT. THE NEXT STATEMENT OBTAINS A COPY OF THE LOCAL FILE TAPES.
COMMENT. THE NEXT STATEMENT ATTACHES THE MACHINE LANGUAGE ("OBJECT
COMMENT. CODE.") CREATED BY RUNNING THE PAM SOURCE CODE THROUGH THE
COMMENT. FOR THE NEXT STATEMENT ATTACHES THE MACHINE LANGUAGE ("CODE
COMMENT. FOR TAM COMPILER IN A PREVIOUS JOR.
ATTACHJAGO, PANSAMPLEBINEY, 1D-SANDMEYER, THE PAM SOURCE CODE THROUGH THE
COMMENT. FOR THE WILL STATEMENT ATTACHES. THE ALPEADY EXISTING TAPEIL
COMMENT. THE HEXT STATEMENT ATTACHES THE ALPEADY EXISTING TAPEIL
COMMENT. THE HEXT STATEMENT LOADS AND EXECUTES THE PAM PROGRAM USING
COMMENT. THE HEXT STATEMENT LOADS AND EXECUTES THE PAM PROGRAM USING
COMMENT. THE HEXT STATEMENT LOADS AND EXECUTES THE PAM FROMENT THE
COMMENT. THE HEXT STATEMENT LOADS AND EXECUTES THE PAMP THE FRANKET THAT
COMMENT. THE NEXT STATEMENT LOADS AND EXECUTES THE PAMP THE COMMENT. THE NEXT STATEMENT LOADS AND EXECUTES THE PAMP THE FRANKET THAT HE PERMANENT
COMMENT. THE NEXT STATEMENT EXTENDS TAPELL. THIS MANS THAT THE FERNANENT
COMMENT. THE NEXT STATEMENT EXTENDS TAPELL. THIS MANS THAT THE PREST STATEMENT. FILE THAT MAS ATTACHED UNDER TOCAL FILE WAMF TAPELL.
COMMENT. FILE THAT MAS ATTACHED UNDER TOCAL FILE WAMF TAPELL.
COMMENT. FILE THAT MAS ATTACHED UNDER TOCAL FILE WAMF TAPELL.

LISTING A-3C SAMPLE RUNSTREAM 3 FOR PAM

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		180.0	0.009		180.0	0.009		180.0	0.009		180.0	0.009		180.0	300.0		180.0	300.0	
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• 35		135.0	800.0		135.0	800.0		135.0	800.0		135.0	0.008		135.0	400.0		135.0	1000.0 900.0 800.0 700.0 600.0 500.0 400.0 1000.0 500.0 1000.0 1000.0 1000.0 1000.0 1000.0 1000.0 1000.0 1000.0 1000.0 1000.0 0ESIGNATOP POWER: 20 PEFIFCTIVITY	ARGETS =
106.00 ANF= 0.00 = 200.0		0.00	1000.0		0.00	1000.0		90.0	1000.0		90.0	1000.0		0.00	500.0		000	500.0 JWER= .20	SEVERAL TARGETS • 20000 • 91000 • 88000
		60.0	1200.0		0.09	1200.0		0.09	1100.0		0.09	1100.0		0.09	0.009		0.09	600.0 01011223 IGHATOP PE	0.0000 ONE DR 000 .29000 000 .91000 000 .88000
IID= .10 ED= .20 TR= = 0.00 PT CLS APP= 8000.0 ACCX=100.00 ACCY 7 IVMX= 10		45.0	1400.0		45.0	1400.0		45.0	1200.0		45.0	1200.0		45.0	700.0		45.0	1000.0 700.0 800.0 700.0 600.0 1000.0 1000.0 10000F = PF00A)AAJS 10C00E= 200533330,5201011223 VFLOC1TY*5.00 HFAN RESP TIME* 106.00 0ESIGHATOP	TIME = 0.00 .29000 1.00000 1.00000
55.00 RITH= 0.10 5.00 RITH= 0.10 5.4 MGLE = 0.00 6. 8000.0 AC	œ	30.0	1600.0	80	30.0	1600.0	ထ	30.0	1300,0	œ	30.0	1300.0	œ	30.0	800.0	æ	30.0	800.0 IOCDOE= 20 RESP TIME≠	1 PELTA 1 . 29000 1 . 00000 1 . 00000 1 . 00000
KLFLANNED TARGET ***********************************	4I(J)=	20.0	1800.0	VI(J)=	20.0	1800.0	#(f)IN	20.02	1400.0	*(٢) IN	20.0	1400.0	→(C)I>	20.0	0.006	MI(J)=	20.0	900.0 PF00A)AAJS 5.00 MFAN	M RANGE = . 29000 1.00000 1.00000 1.00000
PRELANNED TARGET ETH= .00006000 AZOT=25.00 V= 5. TAPGET HEADING A NK= 100 RNG= IORMN= 1 IOPNX	J= 1 THEMH(T.1).	0.0 0.0	2000.0	J= 2 THENH(T.J)=	0.0 0.15MH(I.1)	2000.0	J= 3	-10 (TYNH II)	1500.0	J= 4 THEMH(T.1).	0.0 0.0	1500.0	J= 5 THEMH(1.1)=	0.0 0.0 0.0	1000.0	J= 6 THEMH(T.J)=	0.0 0.15MH (T)	1000.0 10000f = P	0ESIGHATION RANGE= .2°000 .29000 1.00000 1.00000 1.00000 1.00000

LISTING A-4 SAMPLE OUTPUT FROM PAM (PAGE 1 OF 11)

				0ESIGNATION RANGE 1 OELTA TIME=150,0000 UNE OP. SFVERAL TARGETS * 1 .06000 .06000 .06000 .06000 .06000 .06000 .14000 .38000 .38000 .38000 .15000 .15000 .15000 .36000 .36000 .36000 .10000 .10000 .10000 .40000 .40000 .40000 .40000 .09000 .40000 .40000 .12000 .12000 .12000 .40000 .40000 .40000 .12000 .12000 .12000
	SEVERAL TAPGETS = 2 .32000 .93000 .92000 .92000 .91000 .91000 .91000	SEVEP AL TARGETS * 1 .4000 .6000 .71000 .71000 .71000 .72000 .72000 .72000 .74000	SEVERAL TARGETS = 1 .19000 .29000 .27000 .36000 .28000 .28000 .27000 .27000	\$FVEPAL TARGETS * 1 .06000 .16000 .15000 .10000 .00000 .12000
89000 89000 91000 91000 88000 90000 90000 90000	UNE UP. SEVERAL 32000 .32000 .93000 .93000 .92000 .91000 .			0000 000000000000000000000000000000000
1,00000 .89 ,99000 .89 ,99000 .91 1,00000 .88 ,99000 .90	111E 0.0000 0b 32000 32 99000 93 1,00000 93 1,00000 93 1,00000 93 1,00000 93 1,00000 93 1,00000 93	1.ME = 30.0000 DNE DR. 40000 97000 .40000 .90000 .71000 .95000 .95000 .72000 .95000 .95000 .95000 .96000 .96000 .74000 .74000 .74000	TIME = 90.0000 DNE DR -19000 .19000 -69000 .27000 -74000 .32000 -69000 .32000 -69000 .28000 -71000 .28000 -71000 .27000 -72000 .25000	TIME=150.0000 DNE OR .06000 .06000 .14000 .36000 .15000 .42000 .42000 .42000 .42000 .42000 .42000 .42000
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1.00000 .99000 1.00000 1.00000	FANGE = .32000 .92000 .99000 1.00000 1.00000 1.00000 1.00000 .99000	PANGF = . 40000 • 97000 • 97000 • 96000 • 97000 • 95000 • 96000 • 96000	. 1900 . 1900 . 6900 . 7400 . 6800 . 7000 . 71000 . 72000	. RANGE
1.00000 .99000 .99000 1.00000 .99000 1.00000	0.6.5.1 GNATION 32.000 99.000 99.000 99.000 1.00000 1.00000 99.000 99.000 99.000 99.000 99.000 99.000 99.000 99.000 99.000 99.000 99.000 99.000 99.000 99.000 99.000 99.00	0FSIGNATION - 40000 - 97000 - 96000 - 96000 - 97000 - 96000 - 96000 - 96000	0 F S I GN A T I UN - 1 0 0 0 - 6 0 0 0 - 74 0 0 0 - 6 0 0 0 - 70 0 0 0 - 72 0 0 0 - 72 0 0 0 - 72 0 0 0	0E SIGHATION . 06 00 0 . 38 00 0 . 36 00 0 . 40 00 0 . 40 00 0

			00000	.80000	00000	00066.	00006.	00006
			. 65000	. 73000	00026.	92000	00026.	00026.
			. 65000	. 65000	00066.	. 99000	95000	. 95000
			. 68000	.68000	.95000.	. 95000	.95000	00056.
			. 74000	.74000	00096.	. 96000	. 96000	00090.
			. 77000	.77000	.91000	00016	.91000	.91000
	4		٠,	0.00000	0.00000	0.0000	0.0000.0	0.00000
	-		SEVERAL TAPGETS :	INO ONE OP	I	2 OFLTA	RANGE=	OE SIGNATION
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			.91000	.91000	1.00000	1.00000	1.00000	1.00000
			. 94000	. 94 000	1.00000	1.00000	1.00000	1.00000
			. 96000	.96000	1,00000	1.00000	1.00000	1.00000
			.91000	.91000	1,00000	1.00000	1.00000	1.00000
			. 93000	.93000	1.00000	1.00000	1.00000	1.00000
			. 01000	. 1 000	1.00000	1.00000	1.00000	1.00000
			.91000	.91000	1.00000	1.00000	1.00000	1.00000
			. 89000	.89000	00020.	.97000	.97000	00026
	1		v	0.00000	0.0000	0.0000	0.00000	0.00000
	2	n	SEVERAL TARGETS	0.0000 ONE OF	TIME= 0.00	2 DELTA		OESIGNATION
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			. 86000	. 36000	1.00000	1.00000	1.00000	1.00000
			. 93000	.93000	.98000	.98000	00000	00086
			.88000	.88000	00066.	00066.	00066	00066.
			00068.	.89000	00066.	. 99000	٠ ١٩٥٥٥	00066
			00000	.90000	1.00000	1.00000	1.00000	1.00000
			. 88000	. 88000	1.00000	1.00000	1.00000	1.00000
			87000	.87000	1.00000	1.00000	1.00000	1.00000
			0.0000	00000	00000	00000	92000	00026
	-	ŭ	SEVERAL TARGETS	0.0000 ONE OR	TIME 0.00	2 OELTA	RANGE =	OESIGNATION
			0.00000	0.00000	00000	00000.	00000	•
			.02000	.02000	.05000	.05000	.06000	00000
			.01000	.01000	.05000	.05000	.05000	00050.
			.01000	.01000	.06000	.06000	. 06000	00090.
			0.0000	0.00000	.01000	.01000	.01000	.01000
			0.0000	0.00000	.02000	.02000	.02000	.02000
			. 01000	.01000	.01000	• 01000	.01000	.01000
			00000	00000	04000	04000	.04000	.04000
			0.0000	000000	00200	000000	.05000	.05000
	4	ı	0100	.01000		. 01000		.01000
	-	k	SEVERAL TAPGETS	DOO ONE OF	TIME = 300,0000 DNE	1 DELTA	P. ANGE =	OF SIGNATION
			.12000	.12000	.35000	• 32000	• 35000	• 35000
			.07000	.07000		.36000	.36000	00000
			.04000	000 50	·	. 42000	. 42000	00024.
			.14000	.14000	.34000	.34000	.34000	• 34000
1234567890123456789012345678901234567F901234567P901234567890123456789012345678901234567890123456789012	112	89	12345678901234567	1234567890	01234567790	123456789	234567890	12345678901
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SAMPLE OUTPUT FROM PAM (PAGE 3 OF 11) LISTING A-4

.76000 .76000	ONE OP S	0	•	•		.32000 .32000	.29000 .29000	.28000 .28000		•		•	S	0	00090 • 00090•				11000 .11000	00060 00060	·	12000 .12000		ON ONE OF SEVERAL TAPGETS = 1										0.00000 0.00000	N	ċ	•	•	••	• • •		
00096.	000		.56000	.65000	.75000	. 66000	.78000	73000	68000	0000	. 68900	•	000	0.0000	.21000	.39000	.38000	. 43000	41000	38000	37000	31000	.31000	TIME 300.000 001F 1P		00000	05000	11000	00000	00000	.0700	.02000	.05000	.01000	TIME= 0.000	0.0000	.50000	1.00000	1.00000	1.00000	1.00000 1.00000 99000 1.00000	1,00000 1,00000 ,99000 1,00000
. 96000		0	. 56000	. 65000	.75000	.66000	.78000	73000	00067	00000	. 68000	0000		0.0000	.21000	.39000	.38000	43000	71000	38000	37000	31000	.31000	051 TA	2000	00000	00010	11000	00090	08000	.07000	.02000	.05000	.01000	3 OELTA	0.0000	. 50000	1.00000	1.00000	1.00000	1.00000	00000 1.00000 0.0000 0.0000 1.00000
. 96000	RANGE=	0.00000	.56000	.65000	.75000	. 66000	78000	73000	0000	00000	. 74000	00000	RANGE	0.0000	21000	.39000	38000	43000	41000	00086	00000	00016	31000	1 2 2 2	KARGE	00000	00000		00040	0000	00000	02000	.05000	.01000	RANGE =	0	.50000	1.00000	1.00000	1.00000	1.00000	1.00000 1.00000 .99000 1.00000
.93000	OF STENATION	000000	.56000	• 65000	75,000	66000	78000		00067	• 68000	474000	.64000	DESTGNATION	0.0000	21000	30000	38000	00064	00017	00016	. 30000	000	.31000		UE SIGNALIUN	0.0000	00040.	1,000	00011.	00000	00000	00000	00050	. 01 000	OE SIGNATION	0.0000	. 50000	1.00000	1.00000	1.00000	1.00000	1.00000

SAMPLE OUTPUT FROM PAM LISTING A-4

(PAGE 4 UF 11)

7	1	1	.
	N	a	u
SEVERAL TAPGETS 0.00000 -47000 -91000 92000 92000 91000 92000 92000 92000	SEVEPAL TAPGETS 0.00000 6.00000 6.7000 6.6000 7.7000 7.7000 6.6000 6.6000	SEVEPAL TARGETS 0,00000 2,5000 32000 37000 31000 24000 24000 27000	SEVEPAL TARGETS 0.00000 0.00000 0.08000 10000 18000 0.05000 114000
0.0000 ONE UP 00 .00000 00 .47000 00 .92000 00 .92000 00 .92000 00 .92000 00 .92000	71ME 30.0000 DNE DR. 6.00000 470	000 ONE GR 0.00000 .26000 .32000 .37000 .34000 .26000 .26000	0.0000 0.0000 0.0000 0.0000 1.0000 0.0000 0.0000 0.0000 0.10000 0.10000 0.14000
11ME 0.0 0.00000 1.00000 1.00000 1.00000 1.00000 1.00000 1.00000	TIME 30.0 0.00000 147000 95000 95000 95000 95000 95000	TIME 90,0000 ONE DR 0,00000 C 26000 C 26000 C 32000 C 32000 C 36000 C 36000 C 36000 C 26000 C	71ME-150.0000 DNE 0.00000 0.0000 0.0700 0.0700 0.35000 1000 0.35000 1000 0.35000 1000 0.42000 1000 0.42000 1000 0.44000 14000
3 OFLTA 0.00000 1.00000 1.00000 1.00000 1.00000 1.00000 1.00000	3 DELTA 0.00000 .47000 .97000 .95000 .96000 .96000	3 OELTA 0.00000 .75000 .75000 .76000 .65000 .66000	3 DELTA 0.00000 .37000 .37000 .35000 .41000 .38000 .46000
RANGE = 0.00000 . 47000 1.000000 1.00000 1.00000 1.00000 1.00000 1.0000000 1.0000000 1.000000 1.000000 1.000000 1.000000 1.000000 1.000000 1.0000000 1.000000 1.000000 1.000000 1.000000 1.000000 1.000000 1.0000000 1.000000 1.000000 1.000000 1.000000 1.000000 1.000000 1.0000000 1.000000 1.000000 1.000000 1.000000 1.000000 1.000000 1.0000000 1.000000 1.000000 1.0000000 1.0000000 1.00000000	PANGE - 0.00000 - 47000 - 95000 - 95000 - 95000 - 95000 - 95000 - 98000 - 98000	RANGE = 0.00000 . 26000 . 75000 . 76000 . 76000 . 66000 . 65000 . 66000 . 66000 . 66000 . 66000 . 66000 . 66000 . 66000	0.00000 .07000 .37000 .41000 .42000 .42000 .42000 .42000
DF SIGHATION 0.00000 0.00000 1.00000 1.00000 1.00000 1.00000 1.00000 1.00000 1.00000	0.00000 0.00000 0.00000 0.97000 0.95000 0.95000 0.95000 0.99000	0FSIGHATION 0.00000 0.00000 0.75000 0.75000 0.73000 0.65000 0.66000 0.64000	0ESICHATION 0.00000 0.00000 39000 39000 35000 41000 31000 42000 46000 41000

DESIGNATION PANGE 3 OELTA TIME=300.0000 OME OR SEVERAL TARGETS = 1

LISTING A-4 SAMPLE OUTPUT FROM PAM (PAGE 5 OF 11)

				05.51GMATIGN RANGE 4 OELTA TIME 90,0000 DNE DR SEVERAL TAPGETS 1 0,000000
	1	N	-	100000
	₹6€TS =	P. GEETS =	P. GETS =	PGETS = 00000000000000000000000000000000000
0.00000 . 01000 . 02000 0.00000 0.00000 0.1000 0.00000 0.00000	SEVERAL TARGETS 0.00000 0.00000 85000 94000 93000 84000 85000	SEVERAL TARGETS 0.00000 0.00000 95000 94000 93000 98000 88000	SEVERAL TARGETS 0.00000 0.00000 0.1000 0.60000 0.74000 0.62000 0.63000 0.65000 0.67000	SEVERAL TAPGETS 0.00000 0.00000 000000000000000000000
0.00000 .01000 .02000 0.00000 0.00000 0.00000 0.00000	0.0000 ONE OF OF OF OF OF OF OF OF OF OF OF OF OF	0.0000 DNE OR 0.0000 0.0000 0.0000 0.95000 0.000 0.93000 0.000 0.93000 0.93000 0.93000 0.93000 0.93000 0.93000 0.93000 0.93000 0.93000 0.93000 0.93000	000 THE DE 0,00000 0,1000 77000 69000 75000 65000 65000 65000	11ME 00.0000 UNE UN 0.00000 0.00000 0.00000 0.00000 0.00000000
0,00000 ,01000 ,03000 ,03000 ,05000 ,05000 ,05000 ,03000	11HE 0.00 0.00000 0.00000 0.00000 0.99000 1.00000 1.00000 1.00000	TIME 0.000 0.00000 0.01000 1.00000 1.00000 1.00000 1.00000 1.00000 1.00000	TIME 30.0000 UNE UR 0.0000 0.00000 01000 .01000 03800 .74000 .95000 .62000 .97000 .75000 .97000 .62000 .95000 .62000 .95000 .62000	TIME - 90.00 0.0000 0.00000 0000000000
0.00000 .01000 .03000 .03000 .02000 .04000 .03000	0.00000 0.00000 0.00000 0.99000 1.00000 1.00000 1.00000	0.00000 .01000 .01000 1.00000 1.00000 1.00000 1.00000 1.00000	0.00000 88000 88000 99000 99000 99000 99000	4 OELTA 0.00000 0.00000 00000000000000
0.00000 .01000 .03000 .07000 .02000 .04000 .03000	0.00000 0.00000 0.00000 0.99000 1.00000 1.00000 1.00000 1.00000	ANGE - 0.00000 . 0.0000 . 0.0000 . 0.0000 . 1.00000 . 1.	RANGE = 0.0000	RANGE = 0.00000 0.00000000000000000000000000
0,00000 ,01000 ,03000 ,07000 ,02000 ,04000 ,03000	0.00000 0.00000 0.00000 0.00000 0.99000 1.00000 0.99000 1.00000	0.00000 0.00000 0.00000 0.00000 1.00000 1.00000 1.00000 1.00000 1.00000	0.00000 0.00000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	0E SIGNATION 0.00000 0.000000000000000000000000000

LISTING A-4 SAMPLE OUTPUT FROM PAM (PAGE 6 OF 11)

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.33000 .26000 .36000 .27000 .32000 .29000	SEVERAL TARGETS = 0.00000	SEVEPAL TARGETS = 0.00000 0.00000 0.00000 0.00000 0.00000 0.01000 0.01000 0.000000	SEVEFAL TAPGETS = 0.000000	SEVERAL TARGETS = 0.000000
.33000 .26000 .36000 .39000 .27000 .27000	000 THE OR 0,00000 01000 12000 15000 13000 11000 01000 12000		0.0000 THE UP 00 0.00000 000 0.00000 000 .86000 000 .90000 000 .90000 000 .83000 000 .83000 000 .83000	0.0000 UNE UP 0000 000 0.000 0.0000 0.00000 0.00000 0.00000 0.000
.57000 .71000 .80000 .74000 .71000 .75000 .73000	TIMF-150.0000 0. 0.00000 0. 0.0000 0. 0.0000 0. 0.	TIME = 300.0000 UNE UR 0.00000 0.00000 0.00000 0.00000 0.05000 0.01000 0.05000 0.01000 0.05000 0.01000 0.05000 0.00000 0.05000 0.00000 0.05000 0.00000	TIME 0.00 0.00000 0.00000 0.00000 1.00000 1.00000 0.99000	TIME 0.00 0.00000 0.00000 .69000 1.00000
.57000 .71000 .80000 .74000 .71000 .75000 .73000	4 DELTA 0.00000 .01000 .23000 .40000 .41000 .37000 .38000	0.00000 0.00000 0.00000 0.00000 0.0000 0.0000 0.0000 0.0000	5 OELTA 0.00000 0.00000 .66000 1.00000 1.00000 .99000 .99000 1.00000	5 DELTA 0.00000 0.00000 .69000 1.00000
.57000 .71000 .80000 .74000 .75000	RAMGE = 0.00000 . 01000 . 23000 . 45000 . 41000 . 41000 . 37000 . 38000 . 38000 . 35000	RANGE - 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.000000	**A H H H H H H H H H H H H H H H H H H	P.AMGE = 0 • 000000 0 • 000000 0 • 69000 0 1 • 000000
.57000 .71000 .80000 .74000 .71000 .75000	0FSIGNATION 0.00000 .01000 .2000 .40000 .45000 .37000 .38000	0ESIGNATION 0.00000 0.00000 0.00000 0.00000 0.05000 0.04000 0.05000 0.05000	DESIGNATION 0.00000 0.00000 0.00000 0.99000 1.00000 0.99000 1.00000	0F SIGNATION 0.00000 0.00000 0.69000 1.00000

SAMPLE OUTPUT FROM PAM LISTING A-4

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(PAGE 7 OF

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.91000 .95000 .91000 .95000	SEVERAL TARGETS = 0.00000 0.00000 0.57000 0.57000 0.77000 0.77000 0.73000 0.73000 0.57	SEVERAL TARGETS = 0.00000 0.00000 0.22000 0.34000 0.27000 0.27000 0.27000 0.28000 0.29000 0.29000 0.29000 0.29000 0.29000 0.20000 0.29000 0.20	SEVERAL TARGETS = 0.000000	SEVEFAL TAPGETS • 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
.92000 .92000 .95000 .95000	0.00000 0.00000 0.00000 0.57000 0.55000 0.77000 0.73000 73000	0.00000 0.00000 0.00000 0.29000 0.34000 0.27000 0.28000 0.29000	0.00000 0.00000 0.00000 0.0000 0.0000 0.0000 0.0000 0.0000 0.00000	000 ONL OF 0.00000 0.00000 0.00000 0.00000 0.00000
1.00000 1.00000 1.00000 1.00000 1.00000	TIME 30.0000 DHE DP 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.9000 0.9000 0.95000 0.73000 0.95000 0.73000 0.95000 0.73000 0.97	TIME - 00.0000 DHE OP- 0.00000 0.00000 0.00000 .20000 0.72000 .34000 0.72000 0.27000 0.66000 0.27000 0.67000 0.38000 0.71000 0.20000 0.71000 0.20000 0.71000 0.20000 0.71000 0.20000	TIME =150.0000 ONE OR 0.00000 0.00000 0.00000 0.00000 3.0000 13000 3.3200 14000 3.3200 11000 3.3200 0.00000 3.34000 0.00000	TIME = 300,0000 DHC DE 0,00000 0,00000 0,00000 0,00000 0,00000 0,00000 0,00000 0,00000 0,00000 0,00000
1.00000 1.00000 1.00000 1.00000 1.00000	5 DELTA 0.00000 0.00700 .57000 .96000 .95000 .95000 .95000	5 DELTA 0.00000 0.00000 .29000 .72000 .71000 .71000 .77000	5 DELTA 0.00000 0.00000 .07000 .32000 .32000 .36000 .36000	5 DELTA 0.00000 0.00000 0.00000 0.00000 0.05000
1.00000 1.00000 1.00000 1.00000 1.00000	RANGE = 0.00000 0.000000 0.000000	4AHGE= 0.00000 0.00000 .29000 .72000 .71000 .71000 .67000	ANGE = 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.000000	RANGE = 0.00000 0.00000 0.00000 0.00000 0.05000 0.05000
1.00000 1.00000 1.00000 1.00000 1.00000	06 SIGNATION 0.00000 0.00000 0.57000 0.94000 0.95000 0.95000 0.95000	DE SIGHATION 0.00000 0.00000 .29000 .72000 .71000 .71000 .67000	0ESIGNATION 0.00000 0.00000 0.00000 0.0000 0.0000 0.32000 0.32000 0.34000 0.346000	0FSIGNATION 0.00000 0.00000 0.00000 0.00000 0.00000 0.0000

LISTING A-4 SAMPLE OUTPUT FROM PAM

(PAGE 8 OF 11)

12345678901	23456789	0123456789	01234567890	1234567890	123456789012345678	12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890
03000	.03000	. 03000	.03000	.01000	. 01000	
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.04000	.04000	• 04000		0.00000	0,0000	
OE SI GNATION		6 DELTA	T1 NF =	0.0000 NHE DR	67	, 1
0.00000	0.00000	0.0000		0.00000	0.0000	
19000	00000	00000	>	0.0000.0	0.0000	
.92000	92000	00000	00000	87000	19000	
00066	00066	00000		03000	00060	
1.00000	1.00000	1.00000	_	00006.	00000	
1.00000	1,00000	1.00000	1,00000	.93000	93000	
1.00000	1.00000	1.00000		.88000	. 88000	
1.00000	1.00000	1.00000	-	.85000	.85000	
00066	00065	00066	00066.	.87000	. 67000	
DESIGNATION		6 DELTA	TIME=	0.0000 OHE OR	S	2
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0.00000	0.00000	0.0000	0.00000	0.0000	0.00000	
00047	00057.	. 24000	. 24000	.24000	. 24000	
00026	0000	00076.	00026	00006.	00006	
00000	0007	00076.	00074.	. 93000	. 93000	
00000	1.0000	1.00000	-	.84000	. 84000	
00000	00066	00056		00096	00096	
00000	00000	1.0000	00000	00066	00056	
1.00000	0000	1 00000	. 90000	00020	. 84000	
			60000	00075	000/6	
OE SIGNATION	RANGE =	6 DELTA	1.1	DOO TINE 11P.	S	1
0.00000	0.0000	0.0000	0.0000	0.0000	00000 *0	
00000	0.00000	00000	000000	0.0000	000000	
00087	. 28000	.28000	.28000	.28000	.28000	
00000	. 88000	. 88000	.88000	. 77000	. 77000	
94000	00086	. 98000	. 98000	. 70000	. 70000	
00076	00076	000/6	000,6	.82000	. 82000	
00000	00000	00000	00000	. /3000	. /3000	
00000	00000	00000	00046	.63000	. 63000	
0.0035	0007.	. 92000	0.0026	900.9	00029	
00006.	• 36000	. 96000	.96000	000//	. 77000	
OFSIGNATION	RANGE =	6 DELTA	11	OO ONE OF	SEVEPAL TARGETS =	1
00000	000000	0.0000	0.00000	0.0000	0.00000	
00000	000000	0000000	0.00000	0.0000	0.0000	
00001	00091	16000	.16000	.16000	.16000	
000 #4.	00046.	. : 4000	.54000	.29000	.29000	
000000	000062	.67000	.67000	.28000	.28000	
00017				00056.	.33000	
00017	75000	75000	25000	00000	. 25000	
>> :	>	>>>>		. 27000	000.7	

LISTING A-4 SAMPLE OUTPUT FROM PAM

(PAGE 9 OF 11)

(PAGE 10 OF 11)

LISTING A-4 SAMPLE OUTPUT FROM PAM

COLUMN NOS.

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	44	b	ü	00000 6677 78901
3E TS	SETS	GETS	GETS	00000 6666 3456
TAP.	T 0000000000		1AP.)0000 55666 39012
SEVEEAL TAPGETS 0.00000 0.00000 .1000 .15000 07000 .12000 .12000 .10000	SEVERAL TARGETS 0.00000 0.00000 0.00000 0.00000 0.01000 0.02000 0.01000 0.01000 0.01000 0.01000	SEVERAL TAPGETS 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.000000	SEVEPAL TAPGETS 0.00000 0.00000 0.00000 0.93000 0.93000 0.90000 0.90000 0.90000 0.90000 0.90000 0.90000	300000000 3555555 12345678
00000 00000 00000 02000 11000 15000 00000 12000 10000	00000 00000 00000 00000 00000 01000 01000 01000	0 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 UNE DE 0.00000 0.00000 0.00000 .93000 .91000 .94000 .94000	00000 4445 57890]
TIME=150,0000 UNE UR 0,00000 0,00000 0,00000 0,00000 11000 11000 11000 15000 231000 07000 23000 12000 43000 11000 35000 11000		0.0000 INE IR 00.00000 00.00000 00.00000 00.00000 00.0000 00	0.0000 UNE TR 00.00000 00.00000 00.00000 00.00000 00.00000 00.0000 0	000000 44444 123456
E=150.00 .00000 .02000 .31000 .41000 .23000 .43000 .35000	E#300.00 .00000 .00000 .02000 .05000 .05000 .05000		000000000	00000 33334 57890
IME=150.(0.00000 0.00000 0.02000 31000 31000 33000 33000 33000	11HE 300.0000 0.00000 0.00000 0.00000 0.05000 0.05000 0.05000 0.05000 0.05000	DELTA TIME - 00000 0.00 00000 0.00 0.00 0.00 0.00	11ME= 0.00 0.00 0.00 0.00 1.00 1.00 1.00	333333 123454
		DELTA 1 00000 00000 00000 00000 00000 00000 0000		00000 2223 7890
6 DELTA 0.00000 0.00000 0.02000 31000 1.31000 1.31000 1.31000 1.31000 1.31000 1.31000	6 DELTA 0.00000 0.00000 0.00000 0.0000 0.05000 0.05000 0.05000	0.00000 0.00000 0.00000 0.00000 1.00000 1.00000 1.00000 1.00000	0.00000 0.00000 0.00000 0.00000 1.00000 1.00000 1.00000 1.00000	00000 22222 23456
.0000000000		. 0000000000	000000000000000000000000000000000000000	00000 11122 78901
RANGE = 000000	A A NGE = 0.00000 0.000000 0.0000 0.0000	RANGE = 0.00000 0.00000 0.00000 0.00000 11.00000 1.00000 1.00000 1.00000	RAMGE = 0.00000 0.00000 0.00000 0.00000 0.11.00000 0.11.00000 0.0000 0.0000 0.12.00000 0.13.00000 0.13.00000 0.13.00000 0.13.0000000 0.13.0000000000	00 00 00 00 00 00 00 00 00 00 00 00 00
	. N			00000 00111 89012
0651GNATION 0.00000 0.00000 0.00000 0.2000 0.41000 0.2900 0.2900 0.38000 0.38000	SIGNATION 0.00000 0.00000 0.00000 0.0000 0.0000 0.0000 0.0000 0.0000	0.00000 0.00000 0.00000 0.00000 1.00000 1.00000 1.00000 1.00000 1.00000 1.00000	0.00000 0.00000 0.00000 0.00000 1.00000 1.00000 1.00000 1.00000 1.00000 1.00000	00000 00000 34567
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SEVERAL TARGETS = 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.72000 0.66000 0.66000 0.66000 0.66000 0.66000 0.66000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.00000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.00000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.00000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.00000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.00000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.00000 0.0000	SEVEPAL TARGETS = 0.00000 0.00000 0.00000 0.00000 0.27000 0.34000 0.34000 0.22000 0.22000 0.30000 0.30000 0.0000 0.0000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.000000	SEVERAL TARGETS = 0.000000	SEVERAL TARGETS = 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000	00000000000000000000000000000000000000
0.00000 0.00000 0.00000 0.00000 0.00000 0.7200 0.7200 0.66000 0.66000	000 UNE UR 0,00000 0,00000 0,00000 0,28000 2,7000 3,4000 2,24000 2,24000 2,26000 3,30000	0.0000 0.00000 0.00000 0.00000 0.1000 0.7000 0.7000 11,000 0.07000		00000000000 44444455 2345678901
TIME = 30,0000 DNE DR. 0,00000 0,00000 0,00000 0,00000 0,00000 0,00000 0,00000 0,00000 0,0000 0,0000 0,0000 0,0000 0,0000 0,0000 0,0000 0,0000 0,0000 0,0000 0,0000 0,0000 0,0000 0,0000 0,00000 0,0000 0,0000 0,0000 0,0000	TIME = 90.0000 UNF UR 0.00000 0.00000 0.00000 0.00000 .20000 .20000 .70000 .34000 .76000 .34000 .75000 .27000 .75000 .27000	TIME *150.0000 UNE OP 0.00000 0.00000 0.00000 0.00000 11000 11000 .30000 .07000 .45000 .08000 .40000 .1000 .28000 .07000	TIME = 300,0000 UNE UR 0,00000 0,00000 0,00000 0,00000 0,00000 0,00000 0,0000 0,00000 0,0000 0,00000 0,0000 0,00000 0,0000 0,00000 0,0000 0,00000)00000000000 }333333344]2345678901
7 DELTA 0.00000 0.00000 0.00000 0.97000 97000 96000 96000 97000	7 DELTA 0.00000 0.00000 0.28000 71000 76000 78000 78000 75000	7 DELTA 1 0.00000 0.00000 0.00000 11000 30000 45000 32000 280000 27000	7 DELTA 10.00000 0.000000 0.00000 0.00000 0.05	00000000000000000000000000000000000000
PANGE 0.00000 0.00000 0.00000 0.62000 0.96000 0.96000 0.94000	RANGF = 0.00000 0.00000 0.00000 0.20000 71000 7600 77000 77000 75000	RANGE = 0.000000	A M M G E = 0.000000000000000000000000000000000	0000000000 1111111122 2345678901
0.00000 0.00000 0.00000 0.00000 0.00000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	DESIGNATION 0.00000 0.00000 0.00000 0.20000 0.7000 0.75000 0.75000 0.75000	0.00000 0.00000 0.00000 0.00000 11000 30000 45000 32000 28000 27000	0.00000 0.00000 0.00000 0.00000 0.00000 0.05000 0.06000 0.06000	000000000000 0000000011 12345678901;

LISTING A-4 SAMPLE OUTPUT FROM PAM

(PAGE 11 OF 11)

APPENDIX B

LISTING AND SAMPLE CASE OF PRBLOS

APPENDIX B

LISTING AND SAMPLE CASE OF PRBLOS

This appendix contains:

- (1) A listing of the FORTRAN code for the PRBLOS program.
- (2) One set of sample inputs for PRBLOS.
- (3) One sample runstream for PRBLOS.
- (4) Sample output created by running PRBLOS with the sample input.

Note: The column numbers included in some of the listings in this appendix are not a part of the program code, the data, or the output, but are included only for the reader's convenience.

```
PR-PRBLOS9
PP-PRBLU10
PR-PRBLO11
PR-PRBLO12
                                                                                                                                                                                                                                                                                                                                                                                                                                                      PR-PRB1036
PR-PR81037
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          PR-PRBLO50
PR-PRBLO51
                                                                                                                                                                                                                           PR-PRBL019
PR-PRBL020
                                                                                                                                                                                                                                                                                                                                                                                                                                           PR-PRBL035
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        PR-PRBL046
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                PR-PRBL054
PR-PRBL055
                                                                                                                                                                                                                                                                                                                                                                                                                             PR-PRBL034
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 PR-PRBL03B
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              PR-PRBL039
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        PR-PRBL041
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    PR-PRBL042
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 PR-PRBL043
                                                                                                                                               PR-PRBL013
                                                                                                                                                                                                  PR-PRBLO1
                                                                                                                                                                                                                                                                                                                                                                                        PR-PR
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037180
037190
037200
                                                                                                                                                                                                                                                                                                                     037010
037020
037020
037040
037050
037050
037070
037090
037100
0371100
0371100
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                                      036800
036810
036820
036830
036840
036850
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        037210
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 036770
036780
036790
                                                                                                                                                                                                                                                                                            036960
                                                                                                                                                                                                                                                                                                         037000
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              037140
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     037220
                                                                                                                                               036880
                                                                                                                                                             036890
                                                                                                                                                                                        036910
                                                                                                                                                                                                    036950
                                                                                                                                                                                                                 036930
                                                                                                                                                                                                                             036940
                                                                                                                                                                                                                                           036920
                                                                                                                                                                                                                                                       036980
                                                                                                                                                                                                                                                                    1036970
                                                                                                                                                                                                                                                                                036980
                                                                                                                                                                                                                                                        READ (5,280) NODV
IF (NODV.61.20) STOP ' NODV>20 EXCEEDS OIMENSIONS OF PRODV ARPAY
                                                                                   READ (5,220) TGTVEL,TC,(A(I),I=1,6)
IF (EDF(5).NE.0.0) STOP ' ENO OF INPUT '
WRITE (6,230) (A(I),I=1,6)
WRITE (6,240) TGTVEL,TC
MEAD (5,280) NIV
IF (HIV,GT,20) STOP ' NIV>20 FXCEFOS DIMFNSIONS OF PRIV ARPAY '
DO 110 J=1,2
READ (5,250) NIV
WRITE (6,250) NIV
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          170 IF (I.Eq.1) 6G TO 190
PRIVM(1,1)=PRIV(I-1,1)+(PRIV(I,1)-PPIV(I-1,1))*(CD-PRIV(I-1,2))
1 /(PRIV(I,2)-PPIV(I-1,2))
PRIVM(1,2)=0.0
PRIGRAM PPBLOS (INPUT, OUTPUT, TAPE5=INPUT, TAPE6=OUTPUT)
                          DIMENSION PRIV(20,2), PENOV(20,2), PRIVM(20,2)
DIMENSION A(6)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     00 200 J=1,2
200 WPITE (6,300) (PPIVM(I,J), I=1,NIVH)
                                                                                                                                                                                                                                                                                                                                                  140 WRITE (6,300) (PPURV(I,J), I=1, NOUV)
                                                                                                                                                                                                                                                                                               DO 130 J=1,2
READ (5,270) (PECCOV(I,J),I=1,HCCV)
WRITE (6,260) NCCV
DO 140 J=1,2
                                                                                                                                                                                                                               120 WRITE (6,300) (PPIV(I,J),I=1,NIV)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                      DG 160 I=1, MIV
IF (PRIVM(1,2),GT.0.0) GG TG 170
CONTIMUE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          WRITE (6,310) CD, PRIV(NIV, 2)
GO TO 210
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    PRIVM(I,1)=PRIV(I,1)
PRIVM(I,2)=PRIV(I,2)-C0
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         WP.ITE (6,320) NIVII
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        MIVM=NIV-1+2
DO 180 K=2,NIVM
                                                                                                                                                                                                                                                                                                                                                                                                                    DO 150 I=1,NIV
                                                                     100 WP.ITE (6,290)
                                                                                                                                                                                                                                                                                                                                                                                           CD=TC*TGTVEL
                                                                                                                                                                                                                                                                                                              130
                                                                                                                                                                                                                                                                                                                                                                                                                                              150
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  160
                                                                                                                                                                                          110
```

LISTING B-1 FORTRAN LISTING OF PRBLOS PROGRAM (PAGE 1 OF 3)

	037310	PP-PRB1056	
CALL AVEL (PRIV. 20.2 MIV. AVETV)	02220	PD-PDAIN57	
AVEL (PRODV, 20, 2, 1100, 4 VF DOV)	035750	PP-PRRIDSA	
AVEL (PRIVIL) 20.2 - NIVM-AVETUM)	032360	PP-PPBI 050	
	037350	PE-PRBL060	
WRITE (6,330) AVEIV, AVENDV, AVEIVH	037360	FR-PRBL061	
	037370	PR-PRBLO62	
+AVEDUV)	037380	PR-PR81063	
0 WYTHE (05.340) PRETAWN	037390	PR-PR81064	
210 WRITE (6,350)	037410	PP-PRBI 066	
	037420	PR-PRBLO67	
	037430	PR-PRBLO68	
	037440	PR-PRBL069	
C * * * FORMAT STATEMENTS * * *	03 74 50	PR-PRBL070	
	037460	PP-PRBL071	
(2F10.4,6A10)	037470	PR-PP81072	
FURMAT (7H CASE: , 6A10)	037480	PR-PRBL073	
FURHAT (10H TGTVFL= ,F10.4,5x,4HCT= ,F10.4)	037490	PR-PRBL074	
FURNAT (18H PRIV ARRAY: 111V= , IS)	037500	PR-PRBL075	
FORMAT (20H PRODV ARRAY: NOOV= ,15)	037510	PR-PRBL076	
10KNA1 (6FL0•4)	037520	PP-PRBL077	
FURMI (1615)	037530	PR-PPB1078	
FURNAT (IHI)	037540	PP-PR81079	
(1H , 9F12.4)	03220	PR-PRBLUBO	
310 FORMAT (1H +//+19H CRITICAL DISTANCE*+F10.4+72H WHICH IS GREATER TO	T037560	PP-PRBLOB1	
GEST POSSIBLE IN-VIEW SEGMENT , FIO.4,1,23H;	37570	PR-PR81082	
	037580	PP-PRBLU83	
320 FORMAT (20H PRIVM ARRAY: NIVM= ,15)	037590	PR-FRBL084	
330 FORMAT (1H ,//, 32H AVERAGE IN-VIEW SEGMENT LENGTH=,F10.4,/, 36H AVEO37600	37600	PR-PR81085	
1RAGE OUT-OF-VIEW SEGMENT LENGTH=,FIO.4,/,41H AVFRAGE MOOIFIEO IN-V037610	37610	PP-PRBL086	
ZIEW SEGMENT LENGTH=,F10.4)	037620	PP-PR81087	
FORMAT (1H ,//,8H PR.GL OS=,F10,4)	037630	PR-PRB108B	
(//	037640	PR-PRBL089	
END CO.	037650	PR-PRBL090	

LISTING B-1 FORTRAN LISTING OF PRBLOS PROGRAM - CONT'D

(PAGE 2 OF 3)

CHOOLOGIST NEW AVEL OF MILES AVE	03 49 10	SK-AVEL	7
SUBMINITIAL AVEL (1911) IN 110 MAIL	037680	SR-AVEL	3
(SM-181) DIMI-MO)	037690	SR-AVEL	4
	037700	SR-AVEL	5
	037710	SR-AVEL	9
T-GN=DN	037720		7
000=000	037730	SR-AVEL	60
UD 100 1-1340 CHM-CHM.10/T-1-3/-0/T.2//*{P/T+1.1/+P(T.1/)	037740		0
SUMPONITIONS OF TAXABLE STATES OF THE STATES OF THE SUMPONITIONS OF TAXABLE STATES O	037750		0]
100 Contract	037760	SR-AVEL 11	[]
MIS+515-11461.10-10-10-10-10-10-10-10-10-10-10-10-10-1	037770		21
AVERTURAL TO COLUMN TANDAM TO COLUMN	037780	SP-AVEL 13	13
7.0.7.2. 0.7.2.	037790		4 1

LISTING B-1 FORTRAN LISTING OF PRBLOS PROGRAM - CONT'D

(PAGE 3 OF 3)

																							00000000000000000000000000000000000000
P.S	۲.	180.	6.	175.		.R.S	.7	200-	• • •	٥.		175.			٠.		240.		6.		175.		30000000000000000000000000000000000000
1 2000 METF	9.	140.	*874	150.		J 2500 HETF	9.	150.		.874		150.) 9999 METR	9.		210.		.874		150.		000000000000 5566666666 89012345678
ON ZERO TO	• 5	120.	.865	125.		70 2000 TE	ri,	120.		.865		125.		20 TO 10	.5		190.		.865		125.		00000000000 445555555 8901234567
CLOSE TEPRAIM: RAMGE BAND FROM ZFRO TO 2000 HETFPS	4.	70•	. R.S.	100	1000.	TERPAIN: RANGE BAND FROM 2000 TO 2500 NETERS	4.	20.	2	.85	1.0	100.	1000	TERRAIN: FANGE BAND FROM 2500 TO 9999 NETERS	₹.		140.		. 85	1.0	100.	1000	0000000000 3344444444 8901234567
EPRAIN: PA	• 3	50.	æ. c	75.	B 00.	ERPAIN: PA	.3	i.	•	8.	66.	75.	800.	FRRAIN: FA	• •		100.		8.	66.	75.	800.	0000000000 2233333333 8901234567
CLOSE T	. 2 1.0	40.	. 743	50.	•009	CLUSF TI	2.	1.0	1520.	.743	86.	50.		CLOSE T	• 5	1.0	•09	1600.	.743	.98	50.	•009	00000000000000000000000000000000000000
15.	۲۰.	30.	.61	25.	400	15.	.1	• 6	•006	.61	.05	25.	400,	15.	•1	6.	40.	590.	.61	.95	25.	400	0000000000 0011111111 19012345671
3.	0. R	25. 280.	-		200.	3.	•	. c B R	420.	0.	.91	•	.002	3. 11	•	۳.	25.	310.	•	.91	•	200.	00000000

SAMPLE INPUT FOR PRBLOS

B-2

JOB CARD. CHANGE TO CONFORM TO INSTALLATION USAGE.

ACCOUNT CARD. CHANGE TO COMFORN TO INSTALLATION USAGE.

COMMENT. THE FOLLOWING CARD ATTACHES THE MACHINE LANGUAGE (OBJECT COOE) FILE
COMMENT. DE'THE PRELOS PROGRAM. THIS FILE WAS CREATED BY RUNING THE SOURCE
COMMENT. PREVIOUS JOB.

COMMENT. PREVIOUS JOB.

ATTACH-LGG-PRELOS BINARY, ID=SANDHEYPE.
COMMENT. PREVIOUS JOB.

COMMENT. THE NEXT CARD DECLARES TAPES TO BE A FILE OF PECORD TYPE Z WITH
COMMENT. BE OBTAINED FROM THE "FRONT END" COMPUTER WHICH USES A DIFFERENT
COMMENT. BE OBTAINED FROM THE "FRONT END" COMPUTER WHICH USES A DIFFERENT
COMMENT. DEFAULT EECORD TYPE FOR ITS FILES.

FILE, TAPES, AT=Z, FL=80, BT=C.
COMMENT. THE WEXT CARD OBTAINS A COPY OF TAPES (PRBLOS INPUT FILE) FROM
COMMENT. THE WEXT CARD OBTAINS A COPY OF TAPES (PRBLOS INPUT FILE) FROM
COMMENT. THE WEXT CARD LOADS AND EXECUTES THE PROGRAM USING TAPES AS INPUT.
LGOTTAPES, PREUSSAMPLEINPUT, 10=SANDHEYER, ST=MFA.
COMMENT. THE NEXT CARD LOADS AND EXECUTES THE PROGRAM USING TAPES AS INPUT.

LISTING B-3 SAMPLE RUNSTREAM FOR PRBLOS

			.7000		180.0000			0006.		175.0000			0006.		455.0000	
			0009*		140.0000			.8740		150.0000			. 8000		235.0000	
			.5000		120.0000			.8650		125.0000			• 7000		135.0000	
MFTFRS			0004.		70,0000			.8500	1.0000	100,0000	1000.0000		0009.		05.0000	
P.O. T.N. 2000			.3000		20.0000			.8000	0066.	75,0000	800,0000		.5000		75.0000	
BANO FROM ZE	= 15.0000		.2000	1,0000	40.0000	1100.0000		.7430	0086	50.0000	0000.009		.4000		25.0000	
REAIN: PANGE	. 0000 CT	V= 11		0006.	30.0000	500.0000	NOOV= 13		.9500	25.0000	400.0000	4IVM= 9	.3000		5.0000	
CASE: CLUSE TF	TGTVE L= 3.0000 CT= 15.0000	PRIV ARRAY: NIV=	0000 10	. 8000	25.0000	240,0000	PRUNV APRAY: N	0000 0	.9100	0.000	200,0000	PRIVM APRAY: N	. 2500	1,0000	0000.0	1055,0000

AVERAGE IN-VIEW SEGNENT LENGTH* 197.2500
AVERAGE GUT-NF-VIEW SEGMENT LENGTH* 72.5750
AVERAGE MODIFIED IN-VIEW SEGMENT LENGTH* 155.1250

.5749 PR BL OS =

END OF CASE

LISTING B-4 SAMPLE OUTPUT FROM PRBLOS (PAGE 1 OF 3)

		0009*		150.0000			.8740		150,0000			.8000		375.0000	
		.5000		120.0000			.8650		125,0000			.7000		155,0000	
METERS		.4000		70,0000			.8500	1.0000	100,0000	1000.0000		0009*		105.0000	
000 78 2500		.3000		50.0000			.8000	0066*	75,0000	800.0000		.5000		75.0000	
BAND FROM 2 + 15.0000		•2000	1.0000	40.0000	1520.0000		.7430	.9800	50,0000	600.009		0004.		25.0000	
ERRAIN: RANGE 3.0000 CT	IV= 11	.1000	0006.	30.0000	0000,000	NOUV= 13	.6100	.9500	25,0000	400.0000	MIVM= 9	.3000		5.0000	
CASE: CLOSE TERRAIN: RANGE BAND FROM 2000 TH 2500 METERS TOTVEL: 3.0000 CT: 15.0000	PPIV APRAY: NIV=	0000 •0	.8000	25.0000	420,0000	PROOV ARRAY: 1	0.000	0016.	0000 0	200,0000	PRIVM APRAY: !	. 2500	1.0000	0000 0	1475.0000

.7000

200,0000

0006.

175.0000

0006.

855.0000

AVERAGE IN-VIÊW SEGNENT LENGTH* 275.2500 AVERAGE DUT-OF-VIEW SEGMENT LENGTH* 72.5750 AVERAGE MODIFIED IN-VIEW SEGMENT LENGTH* 233.1250

PRBLDS= .6702

END OF CASE

LISTING B-4 SAMPLE OUTPUT FROM PRBLOS (PAGE 2 OF 3)

			.7000		240.0000			0006.		175.0000			.8000		265.0000	
			0009.		210.0000			.8740		150.0000			.7000		195.0000	
			• 5000		190.0000			.8650		125,0000			0009*		165.0000	
METERS			.4000		140.0000			.8500	1.0000	100.0000	1000,0000		.5000		145,0000	
500 TB 9999			.3000		100,0000			.8000	0066.	75.0000	800.0000		. 4000		15,0000	
BAND FROM 2	15.0000		. 2000	1.0000	0000.09	1600.0000		.7430	.9800	20.0000	0000.009		.3000		55.0000	
ASE: CLUSE TERRAIN: PANGE BAND FRUM 2500 TO 9999 METERS	3.0000 CT	IV= 11	.1000	0006.	40.0000	590.0000	NOOV≠ 13		.9500	25.0000	400.0000	NIVH= 10			15.0000	1555.0000
CASE: CLUSE T	TGTVEL=	PPIV AFRAY: NIV=	0000 0	. 8000	25.0000	310,0000	PR.COV ARRAYS	0000 0	.9100	0000 •0	200,0000	PPIVM ARRAY:	.1250	0006.	0.000	545.0000

AVERAGE IN-VIEW SEGHENT LENGTH= 269.2500 AVERAGE DUT-OF-VIEW SEGMENT LENGTH= 72.5750 AVERAGE HODIFIED IN-VIEW SEGMENT LENGTH= 225.5625

PP.8LUS= ,6590

END OF CASE

LISTING R-4 SAMPLE OUTPUT FROM PRBLOS

(PAGE 3 OF 3)

APPENDIX C

LISTING AND SAMPLE CASE OF PREPMS

APPENDIX C

LISTING AND SAMPLE CASE OF PREPMS

This appendix contains:

- (1) A listing of the FORTRAN code for the PREPMS program. In addition to the routines in this listing, PREPMS also uses the functions IDCHAR and NUMRIC and the subroutine PENAME which are included in the COPE listing in Appendix D.
 - (2) One set of sample inputs for PREPMS.
 - (3) One sample runstream for PREPMS.
- (4) Sample output created by running PREPMS with the sample input (and with the records created by the three sample cases of PAM already written to TAPE 11).

Note: The column numbers included in some of the listings in this appendix are not a part of the program code, the data, or the output, but are included only for the reader's convenience.

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PR-PREPM17
PR-PREPM18
PR-PREPM19
                                                                                                                                                                                                                                                                                                                                                                                                                                                 CM+WEATHR3
CM+WEATHR4
PR-PREPM14
DM+M
                                                  PR-PREPMS2
PR-PREPMS3
PR-PRFPMS4
                                                                                                                                                                                                                                 CM+RNGLOS2
CM+RNGLOS3
                                                                                                                                                                                                                                                                    CM+RSPTIM2
CM+RSPTIM3
CM+RSPTIM4
CM+PSPTIM5
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PR-PREPM22
PR-PREPM23
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PP.-PREPM25
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CM+DODF 3
CM+INDEX12
CM+HIT 2
                                                                                                                                                                                                                                                                                                                                           CM+SADARB2
CM+SAOARB3
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CM+SYM80L2
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COMMON / RNGLOS/ HPP, HPLOSE, RNGG(11,2), SEGLOS(11,11), 000520
COMMON / RNGLOS/ HPP, HPP, NRNGCL, CPHGD(11,2), SEGLOS(11,11), 000740
L RNGCLB(11), VETTB(12,2)
COMMON / RSPTHM, FRETRIGE, DOWN OF TREARCA, SI, XHTTHK2,000750
L PSPTH, FRBAR, PRSDT, PRSVT, ALPMA(10,2), RETA(2,2), DETTIM, 000810
S IDSGTP, RUMC, PCRNSG, PRDGW
COMMON / SADARB/ MAX, PACQ(10), PKILL(10,7), SCAMP(10), RADIS, 000860
L RTAB(10), BERRY(10), BERRY(10), PRERX(10), NRAB, 000870
C HFSYS
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                    7R901234567840123730278701770177APE5=1NPUT,TAPF6=0UTPUT,DF84G=0UTPUT032250
PROGRAM PREPMS (INPUT,OUTPUT,TAPE5=1NPUT,TAPF6=0UTPUT,DF84G=0UTPUT032250
032270
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COMMON /INDEXI/ INOXII(201)
COMMON /HIT/ INDEX(6,5,2), PETBL(60,10,7), DITI(6), PKTBL(10,2),
COMMON /HIT/ INDEX(6,5,2), PETBL(60,10,7), DITI(6), PKTBL(10,2),
I NRHGIT, RHGTIF(20), TIF(3,20,2), NPNGPS, RNGPST(10), PSTTBL(10,2,3)
                                                                                                                                                                                                                                                                                                                                                                                                                              COMMON /WEATHR/ PRCLCG, PRCFLS(2), PRGCFL(11,2), W(6,11,2), VIS(11), CLOUD(6), MCC, NVL, PASQL(6), WHDSPD(3,3), HUMID(2), WSUM(2), WCHR(2), ICC, IVL
                                                                                                                                                                                                                                                                                                                                                                                              COMMON /SYMBOL/ BLANK, OECPHT, ALFBET(27), ANUMBR(11), SEP(5),
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         DIMENSION WDATA(193), ACQDAT(161), PSPOAT(49), OFSDAT(31)
DINENSION PODATA(22), PEDATA(4260), PSTDAT(41), AINVDA(167)
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EQUIVALENCE (ACQDAT(1), BATRIM(1))
EQUIVALENCE (PSPDAT(1), BATRIM(1))
EQUIVALENCE (PSRAT(1), DFDGKL(1))
EQUIVALENCE (PEDATA(1), TCRIT)
EQUIVALENCE (PEDATA(1), INDEX(1))
EQUIVALENCE (PSTDAT(1), NRNGFS)
EQUIVALENCE (AINVDA(1), NLTT(1))
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DIMFHSION ILIST(200)
DIMFHSION CHARA(10,30), HUPTHH(70)
DIHENSION IEAY(6)
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LISTING C-1 FORTRAN LISTING OF PREPMS PROGRAM

(PAGE 1 OF

12)

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COLUMN NUMBERS (READ VERTICALLY)
PR-PREPM28
PR-PREPM29
PP-PREPM30
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PP-PREPN36
PR-PREPN37
PP-PREPN38
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                                                                                                                                                                                                                                                                             WRITE (6,640) (A(I), I=1,80)
CALL SEPEC2 (A,80,8,8,10)
IF (8(1,1), E0,10H0PTIOHNORD, NR.8(1,1), EQ,6H0PTWDS) 60 T0 120
IF (8(1,1), E0,10HHEWPECHDD, NR.8(1,1), EQ,6HHEWREC) 60 T0 1P0
IF (8(1,1), EQ,10HPEPORTPECO, NR.8(1,1), FQ,10HRFPRECLIST) 60 T0
IF (8(1,1), EQ,10HPEPORTEPORTPE) 60 T0 560
STOP I IN PREPMS: ERPOR HUMPER 1 **
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         IF (.NDT.NUMRIC(0,P.10,Z)) STOP * IN PREPMS: FRODE NUMBER F * OECODE (10,630,8(1,Z) )XLEV
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  WEITE (6,640) (A(I),I=1,80)
CALL SEPCC (A,80,9,89,810)
IF (,NOT,NUMRICKE,8,10,1); TIP ' IN PEFPNS: FPEOR NUMBEP 4
DECOUE (10,630,R(I,1)) NPT
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     WPITE (6,680) CLABEL
IF (.NDT.NUMRIC(0,8,10,3)) STOP * IN PREPMS: FPROR NUMBER 2
OECODE (10,630,P(1,3) )X
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             IF (.HOT.NUMPIC(0,8,10,4)) STOP ' IN PRFPMS: FREDR NUMBER 3 DECODE (10,630,6(1,4) )Y
                                                                                                                                                                                                        REAO (5,610) (A(I), I=1,80)
IF (EDF(5), EQ.0.0) GO TO 110
CALL CLOSHS (11)
STOP ' IN PREPMS: HORMAL PROGRAM TERMINATION
                                                                                                                                                  CALL OPENHS (11, INDXII, 2001, 1)
CALL REAOMS (11, HOPTHM, 70, RHOPTHMHMS)
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                                                            IRAY(1)=0
IRAY(5)=LOCF(NORFC2)
CALL SYSTEMC (104,IRAY)
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CHAPA(2+IK,IJ)=B(IK,3)
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                                                                                                                      WP.ITE (6,710)
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LISTING C-1 FORTRAN LISTING OF PREPMS PROGRAM - CONT'D

(PAGE 2 OF 12)

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PR-PREP118
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PR-PREP120
PR-PREP121
PR-PREP123
PR-PREP123
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                                                                                                                                                IF (.NOT.NUMRIC(B, B,10,3)) STOP ' IN PREPMS: ERROR NUMBER 6
DECODE (10,630,R(1,3) )ZCASF
ICASE=ZCASE
WRITE (6,700) RLARFL,ICASE
                                                                                                                                                                                                                     GU TU (190,240,290,320,350,370,430,460,500), ICASE
                                                                                                                                                                                                                                                            95 U CV LILITATION UND CVU LILITATION UND CVU LILITATION UND TAIL (6,650) NCCS NVL READ (5,630) PRCLCG, (PRCFLS[1], I=1,2) WRITE (6,660) PRCLCG, (PRCFLS[1], I=1,2) DO 210 J=1,2 PRCCCG, (PRCFLS[1], I=1,2) DO 210 J=1,2 PRCCCGG, (PRCFLS[1], I=1,2) DO 220 K=1,2 DO 220 K=1,2 DO 220 K=1,2 DO 220 K=1,2 DO 220 J=1,1] PREAD (5,630) (W(I,J,J,K),I=1,6) PREAD (5,630) (W(I,J,J,K),I=1,6) PREAD (5,630) (W(I,J,J,K),I=1,6) PREAD (5,630) (WIS(1),I=1,6) PREAD (5,630) (WIS(1),I=1,6) PREAD (5,640) (PASQL(I),I=1,6) PREAD (5,640) (PASQL(I),I=1,6) PREAD (5,630) (WINSPD(I),I=1,6) PREAD (5,630) (WINSPD(I),I)I=1,3)
                                                                        NOPTNH(NOPTI)*HPEAD
CALL WRITHS (11,CHARA,ICHPRL,CLABEL,-1)
CALL WRITHS (11,HOPTHM,70,8HOPTHMHMS,-1)
GO TO 100
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         READ (5,630) (HUMID(1),1=1,2)
WRITE (6,660) (HUMID(1),1=1,2)
CALL WRITHS (11,40ATA,IRLT1,PLABEL,-1)
GO TO 530
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            WRITE (6,660) (CRNGD(I,J),I=1,NRP)
DO 270 J=1,NRHGCE
EAD (6,660) (CRNGD(I,J),I=1,NRP)
BEAD (6,660) (SECLOS(I,J),I=1,NRP)
WRITE (6,660) (SECLOS(I,J),I=1,NRP)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         PEAD (5,620) NRP, NPP, NPIGCL
WRITE (6,650) NRP, NPF, NPGCL
NRNGCB=NRNGCL+1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  DO 250 I=1, IRLT2
                                                                                                                                                                                                                                                      DO 200 I=1, IRLT1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                ACQDAT(1)=0.0
                                                                                                                                              F.L ABEL =8 (1,2)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     D⊓ 260 J=1,2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     CONTINUE
                                                  170 CONTINUE
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LISTING C-1 FORTRAN LISTING OF PREPMS PROGRAM - CONT'D (PAGE 3 OF 12)

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PR-PREP144
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PR-PREP157
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033740
033750
                                                                                                                                                                                                                                                                         READ (5,630) (BATRIM(I),I=1,3),(XHVADF(I),I=1,2)
WRITE (6,660) (BATRIM(I),I=1,3),(XHVADF(I),I=1,2)
READ (5,630) ((BCSPTH(I),I=1,2),J=1,2),(XHVADF(I),I=1,2)
                                                                                                                                                                                                                                                                                                                                                                                                     033860
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                                                                                                                                                                                                                                                                                                                                                       READ (5,630) ((THEAN(I,J)) I=1,2),J=1,2),((TSIGMA(1,J),I=1,2),J=1, 033830
                                                                                                                                                                                                                                                                                                                                                                                 WRITE (6,660) ((TMEAN(I, J), I=1,2), J=1,2), ((TSIGMA(1,J), I=1,2), J=1,033850
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                                                                                                                                                                                                                                                                                                                                                                                                          READ (5,630) ((TRARRY(I,J)):1=1,3); J=1,2)
WRITE (6,660) ((TRARRY(I,J)):1=1,3); J=1,2)
CALL WRITHS (11,RSPDAT,IRLT3,RLABLL,-1)
                                                                                                                  CONTINUE
CALL WRITHS (11,ACQDAT,IRLT2,RLABEL,-1)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 CALL WRITMS (11, DFSDAT, IRLT4, PLABEL, -1)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           DO 340 J=1,3
READ (5,680) (OFDOKL(1,J),I=1,HDFSP)
WRITE (6,660) (OFDOKL(1,J),I=1,HDFSP)
                                               READ (5,630) (RNGCL8(I), I=1, NRNGCL)
WRITE (6,660) (PNGCL8(I), I=1, NPNGCL)
D1 280 J=1,2
READ (5,630) (VELTBL(I,J), I=1,2)
WRITE (6,660) (VCLTBL(I,J), I=1,2)
                                                                                                                                                                                                                         DG 310 J=1,2
READ (5,630) (DETTMA(I,J),I=1,NDT)
WRITE (6,660) (DETTMA(I,J),I=1,HDT)
CONTINUE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               WRITE (6,660) (PRELGS(I), I=1, NPLGSR)
WRITE (6,660) (PERLGS(I), I=1, NPLGSR)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   RUDATA(I)=0.0
READ (5,620) NPLDS
READ (5,630) TCRIT
READ (5,630) (RUGPLS(I),I=1,NPLDSR)
READ (5,630) (PRR.DS(I),I=1,NPLDSR)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      WRITE (6,650) NPLOSE
WRITE (6,660) TCRIT
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      READ (5,620) NDESP
WRITE (6,650) NDESP
                                                                                                                                                                                 RSPDAT(I)=0.0
READ (5,620) HDT
WRITE (6,650) NDT
                                                                                                                                                                       DO 300 I=1, IRLT3
                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Df 330 1=1, IRLT4
DfSDAT(I)=0.0
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         350 DG 360 I=1, IRLTE
                                                                                                                                              GO TO 530
                                                                                                                                                                                                                                                                                                                                                                                                                                                   GU TO 530
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PR-PREP201
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PP.-PREP205
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FR-PREP213
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READ (5,620) NRNCIT

WITE (6,650) NRHGIT

READ (5,630) RHGITE(J),((TTF(I,J,K),K=1,2),I=1,3)

WRITE (6,660) RHGITF(J),((TTF(I,J,K),Y=1,2),I=1,3)

READ (5,630) (DLTI(I),I=1,6)

READ (5,630) (DLTI(I),I=1,6)

OR (90 J=1,2)
                                                                                                                                                  ENCODE (20,610,8(1,1) )(A(1),1=1,20)
DECODE (20,670,8(1,1) )(INDFX(1,1,1,K),K=1,2)
CONTINUE
                                                                                                                                                                                                                                                                                                                                                                                  PSTDAT(1)=0.0

READ (5,620) RRICPS
READ (5,630) RPIGPS
READ (5,630) (RNGPST(1), I=1, HRNGPS)
RRITE (6,660) (RNGPST(1), I=1, HRNGPS)
RAD (5,630) (RNGPST(1), I=1, HRNGPS)
READ (5,630) (PSTTBL(I,J), I=1, HRNGPS)
WRITE (6,660) (PSTTBL(I,J), I=1, HRNGPS)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 CALL WRITMS (11, PSTDAT, IRLT7, RLABFL, -1)
  CALL WRITMS (11, RODATA, IRLT5, RLABEL, -1)
GO TO 530
                                                                                                                                                                                                                                                                             DU 420 1=1,60

OU 420 J=1,10

READ (IUNIT,630) (PETBL(I,J,K),K=1,7)

REITE (6,660) (PETBL(I,J,K),K=1,7)

CONTINUE
                                                                                                                                                                                                                 IF (I.Eq.1.AND.IUHIT.FQ.5) ISTART=2
DO 410 J=ISTART.5
READ (IUHIT.670) (INDEX(I, J.K).K=1,?)
WRITE (6,650) (INDEX(I,J.K).K=1,2)
CONTINUE
                                                                          READ (5,610) (A(I),I=1,80)
CALL SEPEC2 (A,80,8,810)
IF (8(1,1).NE.8HUSETAPE4) GO TO 390
IUNIT=4
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 FEAD (5,630) (PKTEL(1,J),I=1,7)
490 WRITE (6,660) (PKTPL(1,J),I=1,7)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        460 DG 470 I=1, IPLT8
                                                                                                                                                                                                                                                                                                                                                                         00 440 I=1, IPLT7
                                          00 380 I=1,IRLT6
PEDATA(1)=0.0
                                                                                                                               WRITE (6,600)
GO TO 400
                                                                                                                                                                                             00 410 1=1,6
ISTART=1
                                                                                                                                                                                                                                                                                                                                                   GO TO 530
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PR-PREP265
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WRITE (6,590) IPECND,71,12,13,14,15,16,17,18,19
                                          CALL WRITHS (11, AINVDA, IRLTB, RLABEL, -1)
GO TO 530
                                                                                                                                                                                                                                                                                                                                                                                                                                                                   CALL WRITHS (11, WPNDAT, IRLT9, RLABEL, -1)
                                                                                                10 WPNDAT(I)=2, TLI

READ (5,620) MAX

WRITE (6,660) MAX

WRITE (6,660) (PACQ(I), I=1, MAX)

WRITE (6,660) (PACQ(I), I=1, MAX)

DO 520 J=1,7

READ (5,660) (PKILL(I,J), I=1, MAX)

WRITE (6,660) (PKILL(I,J), I=1, MAX)
                                                                                                                                                                                                                            READ (5,630) (SCAMR(1), 1=1,4MX)
READ (5,630) RADIS
READ (5,640) RADIS
READ (5,620) RADIS
READ (5,620) RADIS
READ (5,620) RABE
READ (5,630) RABE(1), 1=1,4NAB)
READ (5,630) RABE(1), 1=1,4NAB)
READ (5,630) (RERY(1), 1=1,4NAB)
READ (5,660) (RERY(1), 1=1,4NAB)
READ (5,660) (RERY(1), 1=1,4NAB)
READ (5,660) (RERY(1), 1=1,4NAB)
READ (5,660) (RERY(1), 1=1,4NAB)
READ (5,660) (RERY(1), 1=1,4NAB)
READ (5,660) (RERY(1), 1=1,4NAB)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     WRITE (6,730) (ILIST(IJ), IJ=1,10UT)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           DG 570 I=2,2000,2
DCGDE (10,580,110X))PECHK
IF (PCHK.NE.41PE00) GG TG 570
IPFCGD=INDXII(I)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 DG 550 I=2,2000,2

IF (IMBX11(T).Eq.0) GG TG 550

ILIST(IGUT)=IMBX11(T)

ILIST(IGUT+1)=IMBX11(I+1)

IGUT=IGUT+2
                                                                                     DG 510 I=1, IPLT9
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           CONTINUE
GO TO 100
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                GO TO 530
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PP-PREP299
PR-PREP301
PR-PREP302
PR-PREP303
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PR-PREP305
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PR-PREP305
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PP-PRE P311
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                                                                                                                                                                                         580 FORMAT (A4,6X)
590 FORMAT (SX,11HPE RECORO: ,A10,4H TR=,F4.0,4H DT=,II,5H VEL=,F2.0,503520
1H GTR=,F3.0,5H RECL=,F4.2,8H ANGLTT=,F4.0,6H PFF8=,F4.0,7H TGTH0=,035310
2F3.0,7H SKSEN=,F3.0)
600 FORMAT (H1 ,36H TAPF4 USFO TO INPUT THIS PE DATA: )
610 FORMAT (B0A1)
620 FORMAT (B11)
630 FORMAT (B11)
640 FORMAT (H1 ,80A1)
650 FORMAT (H1 ,80A1)
650 FORMAT (H1 ,80A1)
650 FORMAT (H1 ,81615)
650 FORMAT (H1 ,81615)
650 FORMAT (1H ,1615)
650 FORMAT (1H ,1615)
650 FORMAT (2110)
650 FORMAT (2110)
650 FORMAT (2110)
650 FORMAT (2110)
650 FORMAT (2110)
650 FORMAT (2110)
650 FORMAT (2110)
                                                                            035220
035230
035240
035250
035260
                                                                                                                                                                                                                                                                                                                                                                                                                                                                     690 FORHAT (1H ,12,37H OPTION CARDS REAP FOR KEYWORD NUMBER,13) 035420
700 FORHAT (1H ,16H PECORD NAMFO : ,410,9H OF TYPE ,12,16H NOW BEING P035430
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                710 FORMAT (1H1)
720 FORMAT (1H ,8(1OH* * * * * ))
720 FORMAT (1H ,97H PCCDRD NAMES AND FILE INFORMATION FOR TAPEII :,/,(635470
11H ,3(AIO, 2X, D2O, IOX)))
035480
035480
035490
                                                                                                                                                                                                                                                                                                                                                                                                                                                     035410
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              035440
                                                                                                                                                         STATEMENTS **
                                                                                                                                                           FURHAT
                                                                                                    GU TH 100
                                                               570 CONTINUE
                                                                                                                                                             * *
```

LISTING C-1 FORTRAN LISTING OF PREPMS PROGRAM - CONT'D

(PAGE 7 0F 12)

CONTINUE CONTINUE					!			V163470107	200 C 0 C 0 C 0 C 0 C 0 C 0 C 0 C 0 C 0	010746370	(READ VERTICALLY)
COMMON /LOCFIG/ F1871, STONML, SPC4(7D), SIRTEC, F751L1 000052 CONNON /SYMEOLY CARRY, DECPMI, AIFMET(27), ANUMAR(111), SEP(5), 000070 CONNON /SYMEOLY CARRY, DECPMI, AIFMET(27), ANUMAR(111), SEP(5), 000070 CONNON /SYMEOLY CARRY, DECPMI, AIFMET(27), ANUMAR(111), SEP(5), 000070 000140 * * * * * FILL IN LOGFLG COMMON NI OCK * * * * * * * 001440 DATA SHRIEC ('IPEL') SEONN / FALSF'/ 001440 * * * * * FILL IN SYMEOL COMMON NI OCK * * * * * * * 001440 DATA ALMIK /IH/ AIR/ AIR/ AIR/ AIR/ AIR/ AIR/ AIR/ AIR	B	OCK DATA RD.	ATA2						035510		
COURTON SYMEOUR ELANIK, DECEMBLY ALFRET(27), ANUMER(11), SEP(5), 000070		MMON /LUGFI		CEONMI.	2011	T0112	, ,		035520		
COMMON YXVALUE/ XVALUF (0.9.2) COMMON YXVALUE/ XVALUF (0.9.2) COMMON YXVALUE/ XVALUF (0.9.2) DOLLAR * * * * FILL IN LOGFLE COMMON BLOCK * * * * * * 001450 DATA FIRST ("TRUE") SEQUEL "FALSE") DATA ALEBET JANA JUNE "DECENT JANA" DATA ALEBET JANA JUNE "DITO" HIP, HE JUN JHY, HH, HH, HH, HH, HH, HH, HH, HH, HH,	9	GICAL FIRST		SPCI	PTEC	T 7 11 1		111	000510	CM+L06FL62	
DOULAR COMMON XVALUE XVALUE (R.9.2) DOULAR COMMON XVALUE XVALUE (R.9.2) DATA FIRST L'TRUE L'S EQUIN L'EAISE.' DATA SHRIEC L'IRGE.' * * * * FILL IN SHORL COMMON BLOCK * * * * * * * * * * * * * * * * * * *	3	IMNON /SYNRO		ECTINT, A	LFRETC	7), All	MAR (11)	. SEP(5).	026000	CHALUGFLGS	
### # TILL III LOGFIG COMMON NI OCK ** * * * * 001100 # * * * * * TILL III LOGFIG COMMON NI OCK ** * * * * 001440 DATA FIRST	-	DOLLAR			!				0-6000	CHASTINGULA	
***** FILL IN LOGFLE COMMON NIOCK ***** DATA FIEST . TRHE. / SEQNML .TALSE./ DATA SHRTEC / TRUE. / SEQNML .TALSE./ DATA SHRTEC / TRUE. / SEQNML .TALSE./ DATA SHRTEC / TRUE. / SEQNML .TALSE./ DATA ALEBET 7.114, JUN. 1107, JUN. 1116, JUN. 1117, JUN. 1114, JUN. JUN. JUN. JUN. JUN. JUN. JUN. JUN.		IMMON /XVALUE	E/ XVALUF (R,	(2,6)					000100	CHANALIE	
* * * * * FILL IN LOGTLG COMMON NICK * * * * * * * * * * * * * * * * * * *									03550	710144000	
DATA FIRSTL / RULE / , SCOUNL / LTAISE / COUT-40 DATA SHRTEC / TRUE / , SCOUNL / LTAISE / COUT-40 * * * * * FILL IN SYMBOL COHMON BLOCK * * * * * * * * * * * * * * * * * * *		*	ILL IN LUGFI	G CRMMI	A DU IN IN	*	*		00000	BU-BUALAZI	
DATA FIRSTI, 'TRUE,', SEQURI, 'L'RAISF.' 041450 04									024700	011106162	
DATA SECTIFICATION TO ** FALSF.' DATA SHRIEC / TRUE.' * * * * FILL IN SYNBOL COHMON BLOCK * * * * * * DATA BLANK / JH / ' DECPNT / JH', JHC, JHC, JHH, JHJ, JHW, JHW, JHW, JHW, JHW, JHW	ΡD		.TRUF./ SI	EQNML /	FALSE.				001770	DITLUGEL 63	
DATA SHRTEC /.TRUE./ * * * * * FILL IN SYNBOL CORNBON BLOCK * * * * * DATA BLANK /IH / DECENT /IH, / DATA ALFBET /IMA INB, IHC, IHC, IHC, IHH, IHI, IHI, IHJ, IHK, 001510 DATA ALFBET /IMA INB, IHC, IHC, IHC, IHF, IHC, IHT, IHU, IHW, IHW, 001540 DATA ALFBET /IMA INB, IHC, IHC, IHC, IHF, IHC, IHT, IHU, IHW, IHW, 001540 DATA ANUMBR /ILMO, IHI, IHC, IHC, IHC, IHF, IHC, IHT, IHC, IHW, IHW, 001540 DATA ANUMBR /ILMO, IHI, IHC, IHC, IHC, IHC, IHC, IHT, IHC, IHW, IHW, 1HW, 001540 DATA DOLLAR /IHS, DATA ANUMBR /ILMO, IHI, IHC, IHC, IHC, IHC, IHC, IHC, IHW, IHW, 1HW, 001540 DATA DOLLAR /IHS, * * * * * FILL IH XVALUE CORHON BLOCK * * * * * * * * * * * * * * * * * * *	PΩ		J-1, (07, 1-1,	O. FALSE	,,				0017100	01.1001164	
# # * # FILL IN SYNEOL COHMON BLOCK * * * * * * * 001480 DATA BLANK / JH / , DECPNI / JH., JH., JH., JH., JH., JH., JH., JH.,	PΟ		.TRUE./		•				001100	DITLUGEL62	
## # # FILL IH SYHBOL COHMON BLOCK			•						001700	DI+LUGFL66	
DATA BLAHK / 114 / DECPHY / 114.	*	*	ILL IN SYNBO	PHIND'S IC	N RI OCK	*	*		001700	PITSTUBULE	
DATA ALEBET 7111, 1 DECEMBL 7111, 1 DATA ALEBET 7111, 1 DECEMBL 7111, 1 1111, 1111									001400	DI + STRBULS	
DATA ALEET THAN 1110, 11	DA	TA BLAHK /11	H / , DECPNI	[/1H./					001510	DT+CVM8015	
** ** * * * * * * * * * * * * * * * *	V O	TA ALFBET /1	114, 111B, 1F	IC, 1HD,	1HE, 1	HF, 1116	, 1HH,	1H1, 1H3,	HK001520	DITTORNO	
DATA ANUBER 71119, DATA ANUBER 71119, DATA ANUBER 71119, DATA BULLAR 71119, DATA DOLLAR 71119, DATA DOLLAR 71119, DATA DOLLAR 71119, DATA DOLLAR 71119, S* * * * * FILL IN XVALUE CONTINON BLOCK * * * * * * * * * * * * * * * * * * *	l,	1HL, 1HN, 1H	HM, 1HO, 1HF	, 1H0,	11R, 1F	S, 1111,	1HU, 1	HV. THW. 1	1X + 001530	DT+SYMBOLZ	
DATA ANUMBR / 1100 1112 1112, 1113, 1114, 1115, 1146, 1147, 1149, 1149, 114-001550 DATA SEP / 114, 1141, 1113, 1144, 1113, 1144, 1115, 1146, 1147, 1149, 1149, 114-001550 DATA DOLLAR / 1145, 1141, 1113, 1144, 1113, 1144, 1115, 1146, 1147, 1149,	2 1	HY, 1HZ, 1H							001540	DT+SYMBOL 8	
## # # FILL IN YALUE COMMON BLOCK * * * * * * * * * * * * * * * * * * *	ď;	TA ANUMBR /1	1HO, 1H1, 18	12, 1113,	184, 1	115, 1H6	, 1H7,	148, 149,	H-001550	DT+SYM8019	
DATA DULLAR /1H5, 1H7, 1H7, 1H7, 1H7, 1H7, 1H7, 1H7, 1H7	7		,						001560	DT+SYMBD10	
## # # FILL IN XVALUE CONMON BLOCK	DA	IA SEP /1119	, 1H/, 1H2,	111(, 111	~				001570	DT+5 YM8011	
* * * * * FILL IH XVALUE COHMON BLOCK * * * * * * * * * * * * * * * * * * *	DA	TA DOLLAR /1	LH\$/						001580	DT+SYMBD12	
# # # # FILL III XVALUE COHMON BLOCK * * * * * * * * * * * * * * * * * * *									001100	DITTONNOTE	
* * * * FILL IN XVALUE CONMON BLOCK * * * * * * * * * * * * * * * * * * *									001610	DI STROUTS	
DATA (((XVALUE(IJJK)) I=1,8),K=1,2),J=1,9) / DUMMY SLOTS FOR HOMINAL RESPONSF TIMES 0 01650 0 480. 1. 2. 3. 3. 5.0. TARGET VELOCITIES 0. 10. 10. 20. 001720 0. 12. 2. 3. 4.0. EFFLECTIVITIES 0. 10. 2. 2. 3. 4.0. 0. 12. 2. 3. 4.0. 0. 12. 2. 3. 4.0. EFFLECTION RIASES -200100. 20. 30. 4.0. 0. 12. 2. 3. 4.0. 0. 13. 2. 3. 4.0. 0. 14. 2. 3. 4.0. 15. 2. 3. 4.0. 0. 18. 0.0180 0. 18. 0.0180 0. 18. 0.0180 0. 18. 0.0180 0. 18. 0.0180 0. 18. 0.0180 0. 0. 18. 0.0180 0. 0. 18. 0.0180 0. 0. 18. 0.0180 0. 0. 18. 0.0180 0. 0. 18. 0.0180 0. 0. 18. 0.0180 0. 0. 18. 0.0180 0. 0. 18. 0.0180 0. 0. 18. 0.0180 0. 0. 18. 0.0180 0. 0. 18. 0.0180 0. 0. 0.0180 0. 0. 0. 0.0180 0. 0. 0. 0. 0.0180 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0		*	ILL IN XVALU	IE COMMO	N BLOCK	*	*		001620	DIAVALUES	
DATA ((XXALUE(I)J,K1), I=1,81,K=1,21,J=1,91) DUMMY SLOTS FOR HOMINAL RESPONSE TIMES 001650 0#60. 0#70. 1.7									001630	DI+ YVAL 1164	
DUMMY SLOTS FOR HOMTHAL RESPONSF TIMES 04065 0486. 0486. 0486. 05. 05. 05. 05. 05. 05. 05. 05. 05. 05	DA	TA (((XVALUE	E(I,J,K), I=1	. 8 8) s K = 1	121,1=1	/ (64			001640	DI + X VA I 1165	
##0.9 ##	1	DUMMY SLOT	IS FOR HOMIN	IAL RESP	ONSF TI	MES			001650	DT+XVALUE	
DESIGNATOR TYPES 1. 2. 3. 5*0., 0.1 1. 5*8., 1. 4. 5*8., 1. 5*8., 1. 5*8., 1. 5*8., 1. 5*8., 1. 5*8., 1. 5*8., 1. 5*8., 1. 5*8., 1. 5*8., 1. 5*8., 1. 5*8., 1. 5*8., 1. 5*8., 1. 5*8., 1. 5*1., 1. 5*8., 1. 5*1., 1. 5*	٦,	8#0.							001660	DT + X VAI UF 7	
DESIGNATOR TYPES DESIGNATOR TYPES 1.1	2	8*8							001670	DI+XVALUER	
1., 2., 3., 5*0., 001690 TARGET VELOCITES 2., 3., 5., 8., 9., 3*0., 001710 CUN-TARGET PAHGES 8., 12., 2., 3*8., 001720 CUN-TARGET PAHGES 8., 12., 2., 3*8., 001730 CONTROLLED INTERPRED INTER		DESIGNATOR	TYPES						001680	DT+XVALIE O	
TARGET VELOCITIES 2. 3.7 5.8 9.7 0.8 3*0.7 001720 CUN-TARGET PARIGES 6.0N-TARGES 8.7 12.7 20.9 30.7 6.7 8.7 001730 PFELECTIVITIES 0.7 1.7 2.7 3.9 4*0.7 001770 O.7 1.7 2.7 3.7 4*0.7 001770 O.7 1.7 2.7 3.7 4*0.7 001770 O.7 1.7 2.7 3.7 4*0.7 001770 O.7 1.7 2.7 3.7 4*0.7 001770 O.7 1.7 2.7 3.7 4*0.7 001770 O.7 1.7 2.7 3.7 4*0.7 001820 O.7 1.7 2.7 3.7 4*0.7 001820 O.7 1.7 2.7 3.7 4*0.7 001820 O.7 1.7 2.7 3.7 4*0.7 001820 O.7 1.7 2.7 3.7 4*0.7 001820 O.7 1.7 2.7 3.7 4*0.7 001820 O.7 1.7 2.7 3.7 4*0.7 001820 O.7 1.7 2.7 3.7 4*0.7 001820 O.7 1.7 2.7 3.7 4*0.7 001820 O.7 1.7 2.7 3.7 4*0.7 001820 O.7 1.7 2.7 3.7 4*0.7 001820 O.7 1.7 2.7 3.7 4*0.7 001820 O.7 1.7 2.7 3.7 4*0.7 001820 O.7 1.7 2.7 3.7 4*0.7 001820 O.7 1.7 2.7 3.7 4*0.7 001820 O.7 1.7 2.7 3.7 4*0.7 001870	-		3.,	5+0.,					00100	01+XVA1110	
TARGET VELOCITIES 2. 3. 3. 5. 3. 4. 3. 3. 40., 0. 1. 2. 7. 3.40., 0. 1. 2. 7. 3. 3. 4. 9., 0. 1. 2. 3. 3. 4. 9., 0. 10. 12. 20., 0. 10. 12. 20., 0. 10. 12. 20., 0. 10. 12. 20., 0. 10. 12. 20., 0. 12. 20.	~	0., 1.	1.,	5*8.,					001100	01 - X VA 1 11 1	
2. 3., 5., 8., 9., 340., 001720 6.0N-TARGET PAHGES 6.0N-TARGET PAHGES 6.0 12. 20. 30., 40., 10., 16., 0., 001750 6.0 11., 2., 30., 40., 5., 6., 8., 001760 6.0 10. 20., 30., 40., 00., 120., 2*0., 001770 6.0 1., 2., 30., 60., 90., 120., 2*0., 001800 6.0 1., 2., 30., 40., 3*0., 001800 6.0 1., 2., 30., 40., 3*0., 001800 6.0 1., 2., 30., 40., 3*0., 001800 6.0 1., 2., 30., 60., 3*0., 001800 6.0 1., 2., 30., 60., 3*0., 001800 6.0 1., 2., 30., 60., 3*0., 001800 6.0 1., 2., 30., 60., 3*0., 001800 6.0 1., 2., 30., 60., 3*0., 001800 6.0 1., 2., 30., 60., 3*0., 001800 6.0 1., 2., 30., 60., 3*0., 001800 6.0 1., 2., 30., 60., 3*0., 001800 6.0 1., 2., 30., 60., 3*0., 001800 6.0 1., 2., 30., 60., 3*0., 001800 6.0 1., 2., 30., 60., 3*0., 001800 6.0 1., 2., 30., 60., 3*0., 001800		TAPGET VEL	OCITIES						00.100	TTOTAL CITY	
6.0%	-		5.9	8.,		3*0.			001110	DITAWALUIS	
GUN-TARGET PAHIGES 0.1 12. 20. 30. 40. 10. 16., 0., 001750 0.0 1.2 2. 3., 4., 5., 6., 8., 001770 0.0 1.0 2. 3., 4.8, 6., 8., 001770 0.1 2. 3., 4.8, 6., 60., 00., 120., 2.8, 6., 001810 0.2 25., 30., 60., 00., 120., 2.8, 6., 001810 0.3 1., 2., 3., 4., 5., 2.8, 001810 0.4 1., 2., 3., 4., 3., 6., 001820 1.2 2., 3., 4., 3., 6., 001850 1.2 2., 3., 4., 3., 6., 001850 1.3 2., 3., 4., 3., 001850 1.4 2., 3., 4., 3., 001850 0.5 1., 2., 3., 4., 3., 001850 0.6 1., 2., 3., 4., 3., 001850 0.7 1., 2., 3., 4., 3., 001850 0.8 FEKER SFISTIVITIES	2	0.,	1.0	2	2	3*B.			001100	OT CANALOTO	
B., 12., 20., 30., 40., 10., 16., 0., 001750 O., 11., 2., 30., 4*0., 5., 6., 8., 001760 O., 12., 20., 30., 4*0., 001780 O., 12., 2., 30., 4*0., 001780 O., 12., 2., 30., 4., 5., 2*0., 001800 O., 12., 2., 30., 4., 5., 2*0., 001800 DEFLECTION RIASES -200., 100., 20., 120., 2*0., 001800 TARGET HEADINGS -60., 10., 2., 3., 4., 3*8., 001850 O., 12., 2., 3., 4., 3*8., 001860 SEEKER SENSITIVITES		GUN-TARGET	PAHGES		•				001130	DI+XVALU14	
00, 1, 2, 3, 4, 5, 5, 6, 7, 8, 9, 001750 • 05, 10, 2, 30, 40, 9, 9, 120, 2*0, 90180 • 01, 1, 2, 30, 60, 90, 120, 2*0, 90180 • 02, 1, 2, 30, 60, 90, 120, 2*0, 90180 • 03, 1, 2, 3, 4, 5, 5, 2*8, 901820 • 01800 • 02, 1, 2, 3, 4, 3*8, 901820 • 01800 • 03, 1, 2, 3, 4, 3*8, 901820 • 01800 • 03, 1, 2, 3, 4, 3*8, 901820 • 01800 • 03, 1, 2, 3, 4, 3*8, 901880 • 01800 • 01800 • 01800 • 01800 • 01800	г	8., 12	20.	30.			14		051700	DITAVALUES	
PFFLECTIVITIE: ***05, ***10, ***20, ***0.** ***05, ***10, ***20, ***0.** ***05, ***10, ***20, ***0.** ***05, ***10, ***20, ***0.** ***05, ***10, ***20,	2	0., 1.			,		4		001100	DITAVALUIO	
.055 .105 .204 .305 .406.9 ANGLES T O. 25. 3. 4*8.9 O. 120. 2*0.9 O. 12. 25.9 30.9 O. 12. 25.9 30.9 O. 12. 25.9 30.9 O. 12. 25.9	PFFLECTIVI			•	``	•	•	001100	TOTAL YEAR		
00, 17, 2.7 3.7 4*8.7 001770 0.1 2.5 30.9 60.9 120.9 2*0.9 001810 0.1 1.2 2.9 3.9 4.9 5.0 2*0.9 001810 0.2 1.2 2.9 3.9 4.9 5.0 2*0.9 001810 0.2 1.2 2.9 3.9 4.9 001820 1.2 2.0 3.9 4.9 3*0.9 001820 0.3 1.2 2.9 3.9 4.9 3*0.9 001870 0.3 1.3 2.9 3.9 4.9 3*0.9 001870 0.4 1.9 2.9 3.9 4.9 3*0.9 001870 0.5 1.9 2.9 3.9 4.9 3*8.9 001870	г	.05,		30.	7.047				0 2 7 0 0	DITAVALUIS	
ANGLES T 0.0170 0.00170 0.001800	~			,	* * *				001780	OI+XVALUI9	
0., 25., 30., 60., 90., 120., 2*0., 001810 DEFLECTION RIASES -200., -100., 0., 100., 200., 3*0., 001820 0., 1., 2., 3., 4., 3*8., 001850 -60., -30., 0., 30., 60., 3*0., 001860 SFEKER SFISTIVITES 0.01800 0.01800 0.01800 0.01800 0.01800		-		,					001100	DITAVALUZO	
00.1 1.7 2.7 3.7 4.7 5.7 2.88.7 00.1820 DEFLECTION RIASES -200., 1.0 2.7 3.0 3.80.7 00.1820 TARGET HEADINGS -60., 1.0 2.7 3.0 60.7 3.80.7 00.1860 SPEKER SFISTIVITES 00.1870 00.1870 00.1870 00.1870 00.1870	-				00	120	40		001800	DI+XVALUZI	
DEFLECTION RIASES -200., -100., 0., 100., 200., 3*0., 001840 0., 1., 2., 3., 4., 3*8., 001850 -60., -30., 0., 30., 60., 3*0., 001860 0., 1., 2., 3., 4., 3*8., 001800 SFEKER SFISTIVITIFS 001890	. ∾			3	•	120.0	240.9		001810	DI+XVALU22	
-200., -100., 0., 100., 200., 3*0., 001850 1., 2., 3., 4., 3*8., 001850 -69., -30., 0., 30., 60., 3*0., 001870 SFEKER SFHSTITVITIFS 001890		DEFLECTION	BIASES		•	•			00100	DITAVALUES	
1.5 2.9 3.7 4.9 3.88.9 001850 TARGET HFAINGS -60.9 1.9 2.9 30.9 60.9 3.80.9 001860 0.0 1.9 2.9 3.9 4.9 3.88.9 001880 SFEKER SFHSTIVITIFS 001890	7	-200., -1	00.0	100.	2002	340.			00100	DI TAVALUZA	
TARGET HFADINGS -60.2 -30.2 0.3 30.3 60.2 3*0.2 001860 0.3 1.2 2.3 3.7 4.2 3*8.2 001860 SFEKER SFHSTIVITIES 001890	~	0., 1.	, 2.,	3.3	, ,	3*8.			001010	DITAYALUSA	
-60., -30., 0., 30., 60., 3*0., 001870 0., 1., 2., 3., 4., 3*8., 001880 SFEKER SFUSITIVITES 001899		TARGET HEA	DINGS						001860	OT +XVALU27	
0., 1., 2., 3., 4., 3*8., 00.1880 SFEKER SFHSITIVITES 00.1890	-	•		30.9	600	3*0.			001870	DI + X VAL 1128	
SEMSITIVITIES 001890	2		, 2.,	3.,	4.,	3*8.,			001880	DT+XVALU29	
			SITIVITIES						001890	DT+XVALUAD	

LISTING C-1 FORTRAN LISTING OF PREPMS PROGRAM - CONT'D (PAGE 8 OF 12)

C-10

MBER:
N NER
OL UM RE A O
989
8888 4567
8888 0123
77777 56789
1777
79990 7890
56666 23456
5566 8901
15555 14567
45555
4444 5678
4444
33334 67890
3333: 2345(
22233
2222 3456
1222 7012
1111
11111
0000
00000000111111111122222223333333333444444455555556666666666

DT+XVALU31 OT+XVALU32	DT+XVALU33	DT+XVALU34	DT+XVALU36	OT+XVALU37	8D-80ATA11	
001900	001920	001930	001940	001960	076100	20000
C THE EDLICHING CARD CONTAINS FALSE SEEKER SENSITIVITY VALUES TO				1 24., 36., 48., 60., (2., 3.0.) 2 0., 1., 2., 3., 4., 3*8./		
CSEC	CSEC	CSEC	CSE		U	

LISTING C-1 FORTRAN LISTING OF PREPMS PROGRAM - CONT'D

(PAGE 9 OF 12)

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COLUMN NUMBERS (READ VEPTICALLY)
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CH+SYMBOL2
CH+SYMBOL3
SR-SERC26
SR-SEPRC27
SR-SEPRC29
SR-SEPRC29
SR-SEPRC10
    SR-SEPRC23
SR-SEPRC23
CM+LOGFLG2
CM+LOGFLG3
                                                                                                             SR-SERRC11
SR-SERRC12
SR-SEPRC13
                                                                                                                                        SR-SEPRC14
SR-SEPRC15
SR-SEPRC16
SR-SEPRC17
                                                                                                                                                                              SR-SEPRC18
SR-SEPRC19
SP-SERRC20
                                                                                                                                                                                                                                                   SR-SERRC25
SP-SEPRC26
SR-SEPRC27
SR-SERRC28
SR-SERRC29
SR-SERRC29
                                                                                                                                                                                                                                                                                                                                                  SK-SERRC35
SR-SEPRC35
SR-SEPRC37
SR-SEPRC37
SR-SERRC39
SR-SERRC40
SP-SEPRC40
                                                                                                                                                                                                             SP-SEPRC21
SR-SERRC22
SR-SERRC23
SR-SEPRC24
                                                                                                                                                                                                                                                                                                            A-SEPRC31
R-SEPRC32
P-SERRC33
                                                                                                                                                                                                                                                                                                                                                                                                                                                                        SR-SERRC47
SR-SEPRC48
SR-SEPRC49
SR-SEPRC50
SP-SEPRC51
SP-SEPRC51
SP-SEPRC51
SP-SEPRC53
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 SP-SEPRC46
   035620
000520
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035720
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03 60 60
03 60 70
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     036100
036110
036120
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   036130
                 COMMON /LOGFLG/ FIRSTL, SEGNUL, SPCL(70), SHPTEC, FTSILL LOGICAL FIRSTL, SEGNUL, SRCL, SHPTEC, ETSILL COMMON /SYMBOL/ BLANK, DECPNT, ALFRFT(27), ANUMBR(11), SEP(5), OULLAR
                                                                  DIMENSION A(N1), B(N2,N3), NCPR(10)
DIMENSION NC(80), PB(80,10), IC(80,10), NUMFLG(10)
SUBPOUTINE SEPRC2 (A,N1,8,N2,N3)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         SFPARATE RECORDS ON IMPUT CARD.
                                                                                                                                                                                                                                                                                               IF (.HDT.FIRSTL) GN TN 200
FIRSTL*.FALSE.
DO 170 1=73,78
CNC(I).NE.0) GN TN 230
CONTINUE
                                                                                                                                                                                                                                                                                                                                                                                                                                                   TO 230
                                                                                                                                                                                                                                                                                                                                                            230
                                                                                                                                                                                                                                                                                                                                                                             190 I=79,80 (NC(I).NE.3) GO TO 230
                                                                                                                                                                                                                                                                                                                                                 180 I=63,72 (NC(I).NE.3) GO TO
                                                                                                                                                                                                                                                                                                                                                                                                         SEGNAL=.TRUE.
WRITE (6,330)
WRIEE (6,340)
GO TO 210
O IF (*MOT-SEGNAL) GO TO
                                                                                                                                                                                                                                                                   DU 160 I=19H1
160 NC(I)=IDCHAR(A9H19I)
                                                                                                                                                       120 NC (1) = 0

120 NC (1) = 0

120 NC (1) = 0

130 I = 1, 11

130 R(I, J) = BLANK

140 RR (I, J) = BLANK

140 RR (I, J) = BLANK

150 NC PR (I) = 0
                                                                                               DO 110 I=1,10
NUMFLG(I)=0
DO 100 J=1,80
IC(J,1)=0
                                                                                                                                      CONTINUE
CONTINUE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                     NC(I)=3
CONTINUE
CONTINUE
                                                                                                                                                                                                                                                                                                                                                                    CONTINUE
                                                                                                                                                                                                                                                                                                                                                                                                 CONTINUE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 I=1
                                                                                                                                                                                                                                                                                                                                                                              8
                                                                                                                                      100
                                                                                                                                                                                                                                                                                                                                                                                                                                                 200
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LISTING C-1 FORTRAN LISTING OF PREPMS PROGRAM - CONT'D

COLUMN NUMBEPS (READ VEPTICALLY)

(PAGE 10 OF 12)

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SR-SEPRC93
SR-SEPRC93
SR-SEPRC95
SR-SEPRC96
SR-SEPRC97
SR-SEPRC97
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     SR-SEPRC99
SR-SEPR100
SP-SEPP101
                                                                                                                                                                                           SR-SEPRC71
SR-SEPRC72
SR-SEPRC73
SR-SEPRC75
SR-SEPRC75
SR-SEPRC76
SR-SEPRC76
SR-SEPRC77
SR-SEPRC77
SR-SEPRC77
SR-SEPRC80
SR-SEPRC80
                                                                                                                                                                                                                                                                                                                                                                                           EPRC88
EPRC89
EPRC90
       SR-SEPRCSS
SP-SEPRCSO
SP-SEPRCSO
SR-SEPRCSO
SR-SEPRCSO
SR-SEPRCSO
SR-SEPRCSO
                                                                                                                                                                                                                                                                                                                                                                                                                             SP-SEPRC91
SR-SEPRC92
                                                                                                               SP-SEPRC64
SR-SEPRC65
                                                                                                                                                                                                                                                                                                                                    SR-SEPRC83
                                                                                                                                                                                                                                                                                                                                                          SR-SEPRC85
                                                                                                                                      SR-SEPRC66
                                                                                                                                                           SR-SEPRC 68
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       2RAM; )
340 FORMAT (12H **PEEPNS** ,38H HOWEVFR, THF PESULTS MAY BF SUSPECT. 1036590
350 FORMAT (80A1)
036610
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     330 FORMAT (12H **PEFFMS** ,109HNUN-FATAL WARNING I YOU HAVE SFQUENCE 036560 INUMBERS IN COLS. 73-78 OF TAPE5. THEY WILL BE PEMOVED BY THE PROG036570
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             036580
                                                                                                                                      036260
036270
036280
                                                                                                                                                                       036290
                                                                                                                                                                                             036310
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                                036170
036180
.036190
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036140
036150
036160
                                                                                                    036230
                                                                                                                                                                                                                                                                                                                                                                                                                    036500
                                                                                                                            036250
                                                                      60 TO 240
IF (NC(I).Eq.3.OR.NC(I).Eq.4.OR.IW.NE.IX) GO TO 270
IW=IW+1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                    STATEMENTS * * *
                                                                                                                                                                                                                                                                                                                                                                DO 320 I=1,MRE
KCHAR=HCPR(I)
ENCODE (80,350,6(1,1) )(P8(J,1),J=1,KCHAP)
320 CONTINUE
                                                                                                                                                                                                                                                                                                     IF (NE.6E.0.4HP.MRE.LE.10) GO TO 310
STOP + IN SEPRC2: ERROR HUNBER 1 '
                                                  IF (I.6T.NI) GO TO 300
IF (NC(I).NE.3.DE.IM.NE.IX) GO TO 260
                                                                                                                                         IF (I.ME.(LSTCMA+1)) GO TO 280
                                                                                                                                                                                                   60 TO 250
IF (MC(I).EQ.3) 60 TO 250
                                                                                                                                                                                                                                                                                                                                           FACODE RECORDS INTO B AFRAY
                                                                                                                                                                                                                                   PB(J,IH)=A(I)
IC(J,IH)=NC(I)
NCPR(IH)=NCPP(IW)+1
OC TO 250
CONTINUE
NRE=IW
                                                                                                                                                                                                                                                                                                                                                                                                                                                                     * * * F O P N A T
                                                                                                                                60 TN 290
                                       LSTCMA=0
                                                                                                                                                                                         LSTCMA*I
                                                                                                                                                                                                                                                                                                                                                                                                                                     RETURN
                                                                                                                                                                              280
                                                                                                                                                                                                                 290
                                                                                                                                                                                                                                                                                    300
                                                   240
                                                                         250
                                                                                                260
                                                                                                                                              270
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LISTING C-1 FORTRAN LISTING OF PREPMS PROGRAM - CONT'D (PAGE 11 OF 12)

SP-NOREC 22 SP-NOREC 23 SP-NOREC 24 SP-NOREC 25 SP-NOREC 26 SP-NOREC 27 SP-NOREC 20 SR-NOREC 20 SR-NOREC 21 SR-NOREC 11 SR-NOR SUBROUTINE MORECZ

LISTING C-1 FORTRAN LISTING OF PREPMS PROGRAM - CONT'D

(PAGE 12 OF 12)

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09•	• 55	040	• 30	• 30	.15	• 05			•	•	•	0.	0.	0.	•	•		009.	• 300			3	010.		110.																					
06.	.85	.80	.60	.75	2.0	9	2	•	•	0.	0.	•	0.	0.	0.	0.	0000	.950	1.00			,	•	, 00	* 00 *	3 50	610.	35	10.	. 01 L	000	033	700	.051	036	25.2	200	200.	200		7007		.022	.011	. 022	, , , ,
. 80	. 75	02	09.	.65	09		. 4		•	• 37	• 30	. 25	•20	.15	.10	٥.	300.	. 700	. 700				270.		• 004	•	•	•	٥.	•	•	•	700			110	710.				•	•				:
66.	.95	00	.85	. 8.5	22.				6	• 50	.45	.40	• 35	• 30	.25	.10	150.	.800	.750				•00•		.004	•	•	•	0.	•	•	•		•			700				•	•			,	
. 95	6		2					60.	.60	.55	• 50	. 4.5	.40	.35	.30	• 20	.06	.500	.450	0021,1		69.	0.	. 343	0.	. 443	0.	•	0.	•	٥.	•	•	400	***		700		.00	3	•	•	700	700		
00	, o ,				•	7 0	0.6	0 !	• 65	.60	• 55	.50	.45	04.	.35	30	30.	.700	009.	NFW RFC 0RO, JUN0600021,1	11	• 22	.004	.032	0.	. 022	0	0.	0.	200.	.004	•	•	•	•		. 000		•	•	•	•	•	•	•	
91	•	.00	10001	1200	.000	.000	3000	3500.	4000	4500.	5000	5500.	6000	6500.	7000	9000	0	.500	.500	NFW RFC	ę	.559	.007	.051	.011	٥.	.018	2001	.004	0.	.004	0.	•004	•	•		,00°	*00.		.007	.00.	*00.	•	200	3	

LISTING C-2 SAMPLE INPUT FOR PREPMS (PAGE 1 OF 15)

. H		٥.	.014																			α	•									.017
7.		.018	• 00•																			7.	•									.028
.212	1372.	٥.	0.	0.	00	•••	٥.	0.	.00.		.014	.256	•00•		0.	0.	0.	0.	0.	•	105	, ,		1372.	0.							0.
.018 5.	014.	. 004	.004	0.	•••	0	*00*	o, c	•	• •	.004	.112	•		0.	٥.	0.	•00•	*00*	•	.213			014.	0.							.017
.004	762.	.00%	0.	0,0		٥.	Ç	•	•	.007	0.	•014	•	0	0.	0.	o, c	• ·	•		.036	,,		762.	.37							0.
. 004 3.	610. 0. 1. 0. 1.1	.60	.0	•	000	٥.																					٥,	0.	,1		69.	0.
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.011	304. 0. 10. 0. 0. NFW EFC	.011	.011	0.0	00.	• 004	0 0	•00•	0.	0.	0.	700.		0.	0.	•	•	200.		0.	• 00•	٦.	• 6	304.	1.15	• 0	•		NEW PEC.	ç	55.	70.

LISTING C-2 SAMPLE INPUT FOR PREPMS - CONT'D

(PAGE 2 OF 15)

			.0 .013 .0 .017 .023 .0 .003 .017 .0 .0 .003 .0 .0 .01 .0 .0 .01 .0 .0 .0 .0 .0 .0 .0 .0 .0 .0 .0 .0 .0 .0 .0
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. 014	Ļ	.103	.017
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. 00.3 . 0 0.0 . 0 0.0 . 0 0.0 . 0 0.3 . 0 0.3	003 003 003 003 003	914.	. 013 . 003 . 0 0
.01	**************************************	.1	0.0007
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.035 .0028 .000 .003	8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	10. 657. 60. 11. 11. 11. 11. 12. 13. 14. 15. 16. 17. 18. 19. 19. 10. 11. 11. 11. 11. 12. 13. 14. 15. 16. 17. 18. 18. 18. 18. 18. 18. 18. 18	.0043 .199 .01 .0033 .003 .026 .137 .007 .007 .003 .003 .00 .003 .01 .003 .01
0035 0000 0000 0000 0000 0000	0003	<u>ب</u>	. 0.06 . 0.02 . 0.02 . 0.02 . 0.02 . 0.04 . 0.03 . 0.03

LISTING C-2 SAMPLE INPUT FOR PREPMS - CONT'D (PAGE 3 OF 15)

œ.	٠.	.013
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. 149 . 003 . 0 . 0 . 0 . 0 . 0 . 0 . 0 . 0 . 0 . 0	.26	.01 .00.3 .00.3 .00.3 .00.3 .00.3 .00.3 .00.3 .00.3 .00.3 .00.3 .00.3
. 003 . 003 . 003 . 003 . 003	,00° ,00° ,104	.007 .003 .003 .007 .003 .003 .003 .003
. 017 . 003 . 0 . 0 . 0 . 0 . 0 . 0 . 0 . 0 . 0 . 0	.66.	. 013 . 003 . 003 . 003 . 003 . 003 . 003 . 003 . 003
. 007 . 003 . 003 . 003		
000000000000000000000000000000000000000	457. 6 . 7 . 8 . 9 . 11 . 22 . 22 . 64 . 64 . 64 . 64 . 64 . 64 . 64 . 64 . 64 . 65 . 66 . 67 . 68 . 68 . 69 . 69 . 69 . 69 . 69 . 69 . 69 . 69 . 69 . 69 . 69 . 69 . 69 . 69 . 69 . 60 .	.003 .003 .001 .001 .003 .003 .003 .003
007 01 003 007 007 007 007	5	.007 .007 .003 .001 .004 .003 .003 .007 .007 .007 .003 .003 .003

LISTING C-2 SAMPLE INPUT FOR PREPMS - CONT'D (PAGE 4 OF 15)

304, 457, 010, 022, 017, 018, 02, 017, 018, 02, 018, 02, 02, 018, 02, 02, 03, 03, 02, 03, 03, 03, 03, 03, 03, 03, 03, 03, 03	. 00.	10.	• • • • •	,		,			
7 .033 .123 .0 .107 9 .007 .017 .0 .027 9 .007 .003 .037 9 .00 .003 .013 9 .00 .007 .003 9 .00 .007 .003 9 .003 .007 .027 9 .003 .007 .027 9 .003 .007 .027 9 .003 .007 .003 9 .003 .003 .013 9 .00 .0 .0 .0 9 .0 .0 .0 9 .0 .0 .0 9 .0 .0 .0 9 .0 .0 .0 9 .0 .0 .0 9 .0 .0 .0 9 .0 .0 .0 9 .0 .0 .0 9 .0 .0 .0 9 .0 .0 .0 9 .0 .0 .0 9 .0	-	457.	610.	.29,	• •	1372.			
7 .033 .123 .0 .107 0 .007 .017 .0 .027 13 .007 .003 .037 13 .007 .003 .013 14 .0 .0 .0 .0 .0 .0 .0 .0 .0 .0 .0 .0 .0	5	•02	•16	6/•	٥.	•			
77 .033 .123 .0 .107 .0 .107 .0 .027 .007 .003 .003 .0027 .003 .003 .003 .003 .003 .003 .003 .00	•	• 53							
17	0	.21	•						
77 .033 .123 .0 .107 .0 .027 .0 .007 .007 .007 .007 .007 .	0	• 26	٠.						
7 .033 .123 .0 .107 9 .007 .017 .0 .027 9 .007 .003 .037 9 .00 .0 .007 9 .00 .0 .007 9 .00 .0 .007 9 .003 .007 .003 9 .00 .0 .007 9 .003 .007 .003 9 .003 .007 .003 9 .003 .007 .003 9 .003 .003 .003 9 .003 .003 .003 9 .00 .0 .0 .0 9 .0 .0 .0 .0 9 .0 .0 .0 .0 9 .0 .0 .0 9 .0 .0 .0 9 .0 .0 .0 9 .0 .0 .0 9 .0 .0 .0 9	20	90.							
7 .033 .123 .0 .107 0 .007 .017 .0 .027 13 .007 .003 .037 13 .00 .00 .003 .013 14 .0 .0 .0 .0 .0 .0 .0 .0 .0 .0 .0 .0 .0	1	50000	-						
77	ر د د ع)	- 67						
13 .007 .017 .0 .027 .027 .0 .027 .0 .027 .0 .003 .003 .0037 .0037 .003 .0037 .003 .003	٤	11	,						
7 .033 .123 .0 .107 .0 .027 .037 .037 .037 .037 .037 .037 .037 .03	151	27.	60.	,		•			
0 007 017 0 0027 13 007 003 037 13 00 0 0 007 13 00 0 0 007 14 00 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	083	.027	. 037	• 033	. 17.3	0.	, 10,	•013	
13 .007 .017 .0 .027 .0 .027 .0 .0 .027 .0 .0 .0 .0 .0 .0 .0 .0 .0 .0 .0 .0 .0	063	•0•	.230						
3 .007 .003 .037 3 .007 .003 .003 13 .00 .00 .003 14 .00 .003 .003 15 .003 .007 .003 16 .003 .007 .027 17 .003 .007 .027 18 .00 .0 .0 .0 19 .00 .0 .0 10 .00 .0 .0 10 .00 .0 .0 11 .01 .01 .06 12 .01 .01 .06 13 .4 .5 .6 10 .00 .3400. 3900.	000		700.	2007	710	c.	. 027	.013	
13 .007 .003 .037 13 .00 .00 .00 .00 14 .00 .00 .00 15 .00 .00 16 .00 .00 17 .00 .00 18 .00 .00 19 .00 .00 19 .00 .00 10 .00 .00 10 .00 .00 10 .00 .00 10 .00 .00 1	1.0		. 12						
13	. 10			700	600	7 60			
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13 .0 .003 .013 17 .01 .02 .017 .0 .017 .003 .0 .007 .003 .0 .007 .027 .0 .	60	0.	.01	0.	٥.	200.			
7 .01 .02 .017 .0 .017 .037 .0 .007 .003 .0 .007 .027 .0 .0 .0 .0 .0 .0 .0 .0 .0 .0 .0 .0 .0 .	013	•	.003	c.	. 003	.013			
7	1 4 6		200	. 5	0.0	710			
7 .00 .017 .007 .003 .003 .003 .003 .003 .003 .00	60	70.							
7 .0 .017 .037 .003 .007 .027 .003 .007 .027 .023 .03 .133 .0 .	0	c.	•	•	•	0.			
17 .003 .007 .003 17 .003 .007 .027 .003 .007 .027 .00 .00 .00 .	03	.017	.007	•	. 017	.037			
17 .003 .007 .027 .003 .007 .027 .002 .03 .03 .01 .0 .	003	٠.	0.	0.	200.	.003			
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7 .023 .03 .133 .01 .00 .1 .01 .01 .06 .7. .2 .7 .0 .0 .0 .00 .3 .4 .5 .6	003	0.	•	•003	000				
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00. 2300. 2700. 3400. 3900.	10	• 003	0.	.01	•	0.			
3 .003 .003 .003 .003 .003 .003 .003 .0			c	ç	0.	0.			
13 .003 .00 .00 10 .003 .00 .003 10 .00 .003 .013 10 .00 .00 .00 11 .01 .01 .00 12 .02 .00 .003 13 .4 .5 .6 10 .2300. 2700. 3400. 3900.	100					•			
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03 .00 .00 .013 0.0 .00 .013 0.0 .0 .00 .01 0.1 .01 .01 .003 1 .762. 014. 1372. 0. 82 .07 .11 0. 2300. 2700. 3400. 3900.	200	•	• 003	.003	•	.003			
3 .0 .003 .013 93 .0 .0 .0 .0 10 .0 .0 .0 11 .01 .01 .06 .7. 12 .752. 014. 1372. 13 .4 .5 .6 10 .2300. 2700. 3400. 3900.	0	0	0.	•	٥.	0.			
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5. 6. (. 3. 762. 014. 1372. 3.82. 07. 11 3.3 .4 .5 .6 00. 2300. 2700. 3400. 3900.	017	• 013	• 01	70.	TO.	95.	ı	•	
5. 762. 914. 1372. .82 .07 .11 .3 .4 .5 .6		۲3		•	5.	ċ	:	· x	
7, 762, 914, 1372, .82, .07, .11 .3, .4, .5, .6 .90, 2300, 7000, 3400, 3900,		10.	11.						
.3 .4 .5 .6	04.	457.	610.	762.	014.	1372.			
.3 .4 .5 .6		c	٠,	.82	. 07	.11			
.3 .4 .5 .6					•				
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.3 .4 .5 .6 00. 2300. 2700. 3400. 3900.	0	-							
.3 .4 .5 .6 00. 2300. 2700. 3400. 3900.	EW P.C.	. ACQDAT012	2,2						
.3 .4 .5 .6 00. 2300. 2700. 3400. 3900.	11	11 5							
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LISTING C-2 SAMPLE INPUT FOR PREPMS - CONT'D (PAGE 5 OF 15)

COLUMN NOS		a •	
00000000000000000000000000000000000000	0.0000.000011111111122222222233333333334444444444	123456789012345678901234567890123456789001224567890012245678900122456789012245678901234678901234678901078900178467890107890017846789001784678900178467890017846789001789001784678900178467890017846789001784678900178467890017846789001784678900178467890017846789001784678900178467890017846789000178467890017846789001784678900178467890001784678900017846789000178467890001784678900017846789000000000000000000000000000000000000	日かれ、中ではそく一つかれ、日かれ、「日かれ、「日かれ、「日かれ、「日かれ、日かれ、日かれ、日かれ、日かれ、「日かれ、日かれ、日かれ、日かれ、「日かれ、「

	.02	130.	230.	300	360.	400*	
25. 40.		130.	230.	400	480.	620.	
25. 40.		130.	210.	320.	380.	420.	
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LISTING C-2 SAMPLE INPUT FOR PREPMS - CONT'D

(PAGE 6 0F 15)

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LISTING C-2 SAMPLE INPUT FOR PREPMS - CONT'D

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LISTING C-2 SAMPLE INPUT FOR PREPMS - CONT'D (PAGE 8 OF 15)

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LISTING C-2 SAMPLE INPUT FOR PREPMS - CONT'D (PAGE 10 OF 15)

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SAMPLE INPUT FOR PREPMS - CONT'D

LISTING C-2

(PAGE 11 OF 15)

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LISTING C-2 SAMPLE INPUT FOR PREPMS - CONT'D (PAGE 12 OF 15)

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SAMPLE INPUT FOR PREPMS - CONT'D LISTING C-2

(PAGE 13 OF 15)

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LISTING C-2 SAMPLE INPUT FOR PREPMS - CONT'D (PAGE 14 OF 15)

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LISTING C-2 SAMPLE INPUT FOR PREPMS - CONT'D

(PAGE 15 OF 15)

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LISTING C-3 SAMPLE RUNSTREAM FOR PREPMS

LISTING C-4 SAMPLE OUTPUT FROM PREPMS

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(PAGE 1 OF 17)

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LISTING C-4 SAMPLE OUTPUT FROM PREPMS - CONT'D

(PAGE 2 OF 17)

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LISTING C-4 SAMPLE OUTPUT FROM PREPMS - CONT'D

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(PAGE 3 OF 17)

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LISTING C-4 SAMPLE OUTPUT FROM PREPMS - CONT'D

(PAGE 4 OF 17)

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CONT'D LISTING C-4 SAMPLE OUTPUT FROM PREPMS (PAGE 5 OF

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LISTING C-4 SAMPLE OUTPUT FROM PREPMS - CONT'D

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345 445 1334 111 11334 475 475 470 470 50 50 50 60 60 60 60 60 60 60 60 60 6	.+	10322,2 1 AC 0DAT 0322 OF TYPE 2 NOW	1.0200 .0400 .1000 .2000 .3000 .3200 1.0000 2000.0000 3000.0000 3500.0000 5000.0000 5900.0000 7000.0000 9999.0000 .1000 .2000 .3000 .4000 .5000 .5000 .5000 .7000	.8000 .0000 1.0000 25.0000 40.0000 70.0000 130.0000 230.0000 400.0000 480.0000 620.0000 1000.000 1330.0000 1600.0000	3.0000 2.0000 4.4.4.4.4.4.4.4.4.4.4.4.4.4.4.4.4.	NEW REC,RSPDAT0223.3 PECURD NAMFO : RSPDAT0223 OF TYPE 3 NOW BEING READ	.1250 .2500 .3750 .5000 .6250 .7500 .8750	5.0000 10.0000 18.0000 24.0000 36.0000 52.0000 87.0000	20.0000 54.0000 97.0000 2 27.6700 47.6700 6.0000 2	32,9200 37,1300 6,9000 6,9000 5,5000 57,0000 89,0000 17,60000 89,0000 89,0000 89,0000 89,0000 89,000	7 NOW REING READ	0 1500.0000 2000.0000 2500.0000 3000.0000 9000. 11500 .1600 .1700 .1800 .	0060 0000	NEW PEC. OFSDATO124,4 RECORD HAMED : DFSOATO124 DF TYPE 4 NOW BEING READ	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	T0224 0F	2 0.0000 0.0000 0.0000 0.0000 4.4.7.4.4.4.4.4.4.4.4.4.4.4.4.4.4.4.4.4	0 60 -
	16789012345i)322,2 ACQDAT032	1 .0200 0.0000 3000 .1000		*	0223,3 : RSPDAT022	.1250				* * * * * * .0127,7 : PSTDAT01:	.0.0000 100	* * * 0300 * * 0	10124,4 1 DFSOATO1	100	4T02	0.0000 0.0000 0.0000 * * * * * * NEXTCASE, 4,	00000000000000000000000000000000000000

LISTING C-4 SAMPLE OUTPUT FROM PREPMS - CONT'D (PAGE 7 OF 17)

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OPTION WORD TYPE RECORD HAMED: TARGETTYPE BEING THPHT
7 OPTION CARDS PEAD FOR KEYWORD HUMBER 14
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OPTION WORD TYPE RECORD NAMED : LOSMODE
4 OPTION CARDS READ FOR KEYWORD NUMPER 11
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                                                             OPT WDS,PLOT,4,5
OPTION WORD TYPE RECORD NAMED : PLOT
4 OPTION CARDS READ FOR KEYWORD NUMBER.
4 OPTION CARDS PEAD FOR KEYWORD HUMBER 1,2, RESETDEFAULTS
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3, 2, TARGETOF PPD TUNITY
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2, 2, RO
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2, 2, PPEPLANNED TARGET
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                    1, 2, PD
2, 2, DON'T RESET
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LISTING C-4 SAMPLE OUTPUT FROM PREPMS - CONT'D

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OPTIDH WORD TYPE PECORD NAMED : TLEFACTOPS BEING INPUT
I OPTION CARDS READ FOR KEYWORD HUMBER 33
                                                                                                                                        OPTION WORD TYPE FECORD NAMED : FOPOSITION BEING INPUT
4 OPTION CARDS_READ FOR KEYWORD NUMBER 17
             BEING INPUT
OPTUDS,DESIGTYPE,6,16
OPTUN WORD TYPE RECORD NAMED : DESIGTYPE
6 OPTUN CARDS READ FOR KEYWORD NUMBER 16
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OPTIQH WORD TYPE RECORD HAMED : RESPITME
15 OPTION CARDS READ FOR KEYWORD HUMBER 23
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2, 2, MANEUVER.UNIT
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1,3,DIGITAL
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3, 2, UP FN
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2, 2, M
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LISTING C-4 SAMPLE OUTPUT FROM PREPMS - CONT'D

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4 OPTION CARDS READ FOR KEYWORD NUMBER 24
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OPTION WOPO TYPE PECORD HAMED : SMOKE
4 OPTION CARDS FEAO FOR KEYWORD HUMBER 32.
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2 OPTION CARDS READ FOR KEYWORD NUMBER 31
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PFCOPD NAMED : RSPDATO123 OF TYPE 3 HOW
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SAMPLE OUTPUT FROM PREPMS - CONT'D LISTING C-4

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LISTING C-4 SAMPLE OUTPUT FROM PREPMS - CONT'D

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LISTING C-4 SAMPLE OUTPUT FROM PREPMS - CONT'D (PAGE 12 OF 17)

17) OF. (PAGE 13 LISTING C-4

SAMPLE OUTPUT FROM PREPMS - CONT'D

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LISTING C-4 SAMPLE OUTPUT FROM PREPMS - CONT'D

(PAGE 14 OF 17)

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LISTING C-4 SAMPLE OUTPUT FROM PREPMS - CONT'D

(PAGE 15 OF 17)

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LISTING C-4 SAMPLE OUTPUT FROM PREPMS - CONT'D

(PAGE 16 OF 17)

- CONT'D SAMPLE OUTPUT FROM PREPMS LISTING C-4

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APPENDIX D

LISTING AND SAMPLE CASE OF COPE

APPENDIX D

LISTING AND SAMPLE CASE OF COPE

This appendix contains:

- (1) A listing of the FORTRAN code for the COPE program.
- (2) One set of sample case inputs for COPE.
- (3) One sample runstream for COPE.
- (4) Sample output created by running COPE with the sample input (and with the TAPEll created by previous PAM and PREPMS sample case runs). The output produced on TAPE8 by this run (for cases 1 and 2) is included in Listings 7-1 and 7-2 of section 7.6.

Note: The column numbers included in some of the listings in this appendix are not a part of the program code, the data, or the output, but are included only for the reader's convenience.

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-TAPE9 IS THE FILE TO WHICH PRINTER.

-TAPE9 IS THE FILE TO WHICH PRINTER PLOTS WILL BE WRITTEN IF 00222

-TAPE1 IS THE FILE TO WHICH THE CACCOMP PLOT OUTPUT WILL BE WRITTEN IF AND WHEN THAT PLOT OPTION IS IMPLEMENTED.

-TAPE1 IS THE FILE TO WHICH THE CACCOMP PLOT OUTPUT WILL BE NOW 00222

-TAPE1 IS THE WOR ADDRESSABLE MASS STORAGE WOATA RASSE FILE EROM 00222

-TAPE1 IS THE PURPARENTED AND PARE PERFORMS USED TELL THE EIGHT DATA 00222

HHICH COPE OBTAINS THE DATA RECREOS USER TELLE FILE BOOM 00222

THE PREPARS AND PARE PERPORCESSORE TO TAPE11 IS CREATED BY 00222

THE PREPARS AND PARE PERPORCESSORE TAPE1.
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TAPE4, TAPE7, TAPE8, TAPF9, TAPE10, TAPF11)
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COMMON JENGALY DAIS, IIH, HCASE, ICCPEG, IPPIG
COMMON /IIME/ DURLGS, IIHHOW, TOF, TBR, IIHPA, IIMRAI
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         COMMON /BAIL/ BLORMS, IRAIL
COMMON /DODF/ DEFORL(10,3), NDFSP, NDUKIL, POKILD
LOGICAL DOKILD
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CALL INITLZ
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LISTING D-1 FORTRAN LISTING OF COPE PROGRAM

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IF (EMDREP) 93 TO 140
    BEGIN "REPLICATION" LOGP
                                                                          CALL ARTCHK
IF (FNDREP) GO TO 140
                                                                                                                               CALL VISCHK
IF (ENDREP) GO TO 140
                                                                                                                                                                              CALL DETCTN
IF (FNDREP) GO TO 140
                                                                                                                                                                                                    CALL SMOKE
IF (ENDREP) GO TO 140
                                                                                                                                                                                                                            CALL DUST
IF (EMPREP) GH TH 140
                                                                                                                                                                                                                                                  IBATL=1
CALL BLUCHK
IF (ENDREP) GO TO 140
                                                                                                                                                                                                                                                                                                        IBAIL+2
CALL BLDCHK
IF (FHDREP) GO T9 140
                                                                                                                                                       CALL RNGCHK
IF (ENDREP) 60 TH 140
                                                                                                                                                                                                                                                                                  CALL GETTIM
IF (ENDREP) GO TO 140
                                                                                                                                                                                                                                                                                                                                                                                            120 CALL L9SCHK
IF (FHDREF) 60 TO 130
                   110 KPF=1
TIMHOW=0.0
TIMBA=0.0
ENDREP=.FALSE.
NVEHKL=0
DUKILD=.FALSF.
                                                                                                                                                                                                                                                                                                                                                                              BFGIN "POUND" LAGP
                                                                                                 CALL GETVIS
                                                                                                                CALL GETRING
                                                                                                                                                                                                                                                                                                                                                               CALL ADDIDE
                                                                                                                                                                                                                                                                                                                                                                                                                     CALL WAPINDO
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(PAGE 2 OF 82)

COLUMN NUMBERS	(READ VERTICALLY)
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PP-CQPE107 PP-CQPE108 PP-CQPE109 PR-CQPE111 PR-CQPE111	PR-COPELLS PR-COPELLS PR-COPELLS PR-COPELLS PR-COPELLY PR-COPELLS PR-COPELLS	PF-COPE121 PR-COPE122 PR-COPE123 PR-COPE124 PR-COPE126 PR-COPE126 PR-COPE127	PR-COPE131 PR-COPE131 PR-COPE132 PR-COPE133 PR-COPE135 PR-COPE136 PR-COPE136 PR-COPE136	PR-COPEL40 PR-COPEL41 PR-COPEL44 PR-COPEL45 PR-COPEL45 PR-COPEL45 PR-COPEL46 PR-COPEL46
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IF (ENDREP) GO TO 130 C CALL OFCIK IF (ENDREP) GO TO 130 C CALL DEIDE!		C CALL HITCHK IF (EHOREP) GN TN 130 C CALL PKCHK C 130 IF (KRE-E9.NRF) GN TN 140 C CALL AODTBR	KRF=KRE+1 ENDRP=.FALSE. GO TO 120 C FNO "ROUNO" LOOP C I40 IF (KREP.EQ.HREP) GO TO 150 KREP=KREP+1	C END "REPLICATION" LOOP 150 CALL OUTPUT C IF (.NDT.ENOFLG) GO TO 100 C END "CASE" LOOP C STOP ' IN COPE: NORMAL PROSPAN TERMINATION ' C ENO

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D (PAGE 3 OF 82)

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CM+ D1SPLY2
CM+ FATTING
CM+ FARES P2
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CM+ LD GFL G3
CM+ LD GFL G3
CM+ CD GFL G3
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                                                                                                                                                                                              CONMON /ACHAR/ CHARLIO,120), NR.C
COMMON /DESRNG/ DESRNG(19,2)
COMMON /DESRNG/ DISPT(24), DISPM(12), RECLBL(8), TMPLBL(8)
COMMON /FITTIN/ TOTARY(16,2)
COMMON /FSRESP/ FSRT(14,2)
COMMON /HEADHG/ ACQUBL(2,4), DAYLRL(2), DFSLBL(?), DGTLRL(2,2),
COMMON /LOGE(G/ FIRSTL, SEANML, SPCL(70), SHPTEC, FTSILL
LOGICAL FIRSTL, SEANML, SPCL(70), SHPTEC, FTSILL
COMMON /POINT/ IPOINT(70)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 I PSHKKL
COMHON /STITLE/ SLVERS, VECPAT(2)
COMHON /SYMBOL/ BLANK, DECPNT, ALFBFT(27), ANUMBR(11), SEP(5),
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   COMMON /SMMKED/ SNK2(3,3,2), SMK5(3,3,2), FRONT, NSNK2, NSNK5,
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1 10HDEIGNATUR,10H H HUDIFF,10HCT FIPE

2 10HTARGET BEY,10HHUD DESIGN,10HLTY RANGE,
3 10HTARGET BEY,10HHUD DESIGN,10HLTY RANGE,
4 10HTARGET BEY,10HHUD DESIGN,10HLTOR RANGE,
5 10HSMOKE KILL,10HED HISSIM,10H
5 10HBOSTGWARDP,10H BAILED-GU,10HT PPE-COHM,
8 10HCOMHO DUT,10HGROTH VOIC,10HE E DIGTL),
9 10HERROR HT,10HRANBHISSID,10HT PPE-COHM,
8 10HCORNO DUT,10HGROTH VOIC,10HE E DIGTL),
9 10HERROR LT,10HRANBHISSID,10HT PRST-CM,
10HLOS LOST -,10H HO FIRITHG,10H
10 10HCSIGMATOR,10H RANGE,10HD H TINE,
E 10HERGUND RELL,10HABILITY FA,10HILUPE
F 10HERGUND RELL,10HABILITY FA,10HILUPE
F 10HERGUND LIANARG,10H T WARRE,10H HIT,10HRANHIT,10HHUT FIRAGES,10H T MARIE,10H HIT IN INT INT,
11 10HRGUND HIT,10HBUT DID HO,10HT KILL

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1.90.10HTRSTCASE ,7*1H ,
2.94.10HHEXTCASE ,7*1H ,
3.90.10HENDFCASE ,7*1H ,
3.90.10HENDFCASE ,7*1H ,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    COMMON /XVALUE/ XVALUF(8,9,2)
                                                                                                                                                                   COMMON /ABREBL/ IDABET(3,19)
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LISTING D-1 FORTRAN LISTING OF COPE PROCRAM - CONT'D

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BD-BOAT103
BD-BOAT104
BD-BDAT105
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BD-BDATA75
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BO-BDATA99
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B0-BOATA73
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BD-BDATABB
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BO-BDATA56
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BD-BDATA97
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BO-BDATA69
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BD-BDATAB6
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        22.,50.,101ACQUISITIQ,101NRANGEDIST,10HRIBUTION
22.,50.,101ACQREGUIST,7*1H , ,6*1H ,
23.,12.,10HRESPTINE ,7*1H , ,6*1H ,
23.,12.,10HRESPTINE ,7*1H ,
24.,4.,10HOTRECTFIRE,10HSUPPRESSIG,10HN ,
25.,0.,10HARANGHOCCU,10HSPENCEDIST,10HRIBUTION ,
25.,0.,10HRANGHOCCU,10HRFENCEDIST,10HRIBUTION ,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     26.,0.,10HPEDATA ,7*1H ,
27.,4.,10HTAKGEFPRISIADHUREDISTRIB,10HUTION
27.,4.,10HTGTPSTDIST,7*1H ,
28.,0.,10HIHVARIANT ,7*1H /
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             74.10.10HIGTVEL 77.1H 74.1H 75.1H                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    ,6*1H ,
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41,,0,,10HDARTILLER,10HYPR
41,,0,,10HOJARPK ,7*1H,
                                                                                                                                                                                               DATA ((CHAR(1,J),I=1,10),J=14,23)/
11.,4.,1DHLINEOFSIGH,1OHTHODF
11.,4.,1OHLOSMODE ,7*1H,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              DATA ((CHAR(1,3)) 1=1,10), J=24,37)/
21.,10.,10HWEATHER ,7*1H ,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          DATA ((CHAP(I,J), I=1,10), J=38,39)/
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             2 41.,0.,10HOJARPK ,7*1H, ,3 42.,0.,10HTARGETVEL 0,10HCJTY
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   ,7*1H ,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     45.,0.,10HTIMEDFFLIG,10HHT
                        ,7*1H ,
                                                                     7.50.10HTEMPORAPY 57*111 57.50.10HTEMPORAPY 57*111 98.00.10HRESET 57*111 99.53.10HCENTROL 57*111 /
                                                                                                                                                                                                                                                                         12.,6.,10HMISSIDHCOD,10HE
                        6.,0.,10HOVERIDE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 45.,0.,10HTUF
46.,0.,10HANGLFT
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2 32.,4.,10HSMUKE
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       5., 4., 1 OHPLUT
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LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D (PAGE 5 OF 82)

5555555666666666777777777788888888889 COLUMN NUMBERS 345678901234567B90123456789012345678901

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

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COLUMN NUMBEPS (READ VERTICALLY)

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01+LOGFLG2
01+LOGFLG3
01+LOGFLG4
01+LOGFLG5
01+LOGFLG5
                                                                                                                                                                  ED-80A1169
80-80A1170
80-80A1171
80-80A1173
80-80A1174
80-80A1174
80-80A1177
80-80A1177
80-80A1178
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80-80AT200
80-80AT201
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80-80AT196
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8D-8DAT183
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80-8DAT167
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BD-BDAT194
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001500
001510
                                                                                                                                                                                      DATA ((ACQLBL([,J,],I=1,2),J=1,4) /10HAVERAGE TE, 5HRRAIH, 10HCLUSE005170

1 TERR, 3HAIN, 10HOPEN TERPA, ZHIM, 10HSIAGS TERR, 3HAIN/ 005100

DATA (DAYLBL(I),I=1,2) /8HDAY TINE, 10HNIGHT TIHE/ 005200

DATA (DESLBL(I),I=1,2) /4HHIGH, 4HUDHE/ 005200

DATA (GGTLBL(I),I=1,2) /4HIGH, 4HUDHE/ 005210
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              005400
B005410
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005480
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00508D
005090
005100
005110
                                                                                                                                                                                                                                                                                                          10HM, 1HO/
DATA ((DOLBL(I,J),I=1,3),J=1,2) /10HDESIGNATOR, 10H AT VANTAG, 7HE00529D
DATA ((DOLBL(I,J),I=1,3),J=1,2) /10HDESIGNATOR, 10H VT /
005250
DATA ((ROLBL(I,J),I=1,4),J=1,2) /10HCONTINUOUS, 10H LOS ("SHO, 10H005260 10TING GALL, 5HER""), 10HBRDKFH LOS, 10H ("RANDOM") 10HOCCUPRENCE, 005270 25H")/
                                                                                             DATA ((FSRT(I,J),I=1,14),J=1,2) /.0, .03, .21, .60, .75, .83, .88,00512D
1 .91, .93, .95, .97, .98, .99, 1.0, 20., 40., 60., 80., 100., 120.005130
2, 14D., 160., 180., 200., 220., 240., 260., 280./
                                                                                                                                                                        005160
                                                                                                                                                                                                                                                                                                                                                                                                                     DATA ((RSPLBL(I,J),I=1,3),J=1,3) /10HPFE-PLANHE, 10HD TARGET , 1H005290
1 , 10HTARGET OF , 10HOPPORTUHIT, 1HY, 10HPRIORITY P, 10HRE-PLANNED0053D0
                                                                                                                                                                                                                                                                                                                                                                                                                                                               005310
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       DATA (((SIK5(1,j,K),1=1,3),j*1,3), K=1,2) /123D., 240., 168., 0., 116., 0., 0., 800., 0., 656., 160., 118., 0., 300., 0., 0., 436.,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              * * * *
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             DATA SLVERS 16.21 , (VERDAT(I), I=1,2) /10H6 MARCH 19, 2HR0/
                   DATA (THFARY(I), I=1,16) /7*0., 31., 3*0., 44.4, 3*0., 67./
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      * * * *
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                                                                                                                                                                        * * * * FILL IN HEADMG COMMON BLOCK * * * *
                                                      * * * *
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              FILL IN (PART OF) SMOKED COMMON BLOCK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       *
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         DATA (IPOINT(I), I=1,70) /1, 2, 3, 4, 66*5/
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       * * * * * FILL IN SYMROL COMMON BLOCK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        FILL IN STITLE COMMON BLOCK
                                                          FILL IN FSRESP COMMON BLOCK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      * * * * * FILL IN LUGFLG COMMON BLOCK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         DATA FIRSTL /.TRUE./ , SEQUML /.FALSE./
DATA (SPCL(I).I=1,70) /70*.FALSE./
DATA SHRTEC /.TRUE./
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    FILE IN POINT COMMON BLOCK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            DATA BLANK / 111 / , DECPNT / 1H./
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     DATA FRONT /12.0/
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LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

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ה, ר	DATA ALFRET /1HA 1, 1HL, 1HM, 1HH, 2 1HY, 1H7, 1H1/	1 /188, 188, 1	1118, 1 1117, 111	HC, 1HP.	, 141E, 141P, 1	1HE, 1HC HS, 1HT,	3, 1HH,	DATA ALFRET /14A, 14B, 14C, 14P, 14F, 14E, 14G, 14H, 14I, 14J, 14K001520 1. 11L, 14H, 14H, 14H, 14H, 14F, 14G, 14F, 14S, 14T, 14U, 14V, 14W, 14X, 001530 2. 14Y, 147, 147, 147, 147, 147, 147, 147, 147	1HK 001520 HX, 001530	DT+SYMBOL6 DT+SYMBOL7	
² =	ATA ANUME	3R / 1HO,	1111, 1	112, 1113,	, 1H4,	1115, 1116	, 1H7,	001540 DATA ANUMBR /1140, 1141, 1142, 1143, 1144, 1145, 1146, 1147, 1140, 114-001550 /	1H-001550	DT+SYMBOL9	
06	∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + ∀ + Y +	SEP /1H5, 1H7, 1H7, 1H0, 1H1/	1, 143,	106, 10	718				001570	DT+SYM8011	
2	אנא נסלבו	T							001580	DT+SYMBD12 DT+SYMBD13	
4	4								005540	BD-BDAT207 DT+XVALUE2	
*	# # #	FILL	IN XVAL	FILL IN XVALUE COMNON BLOCK	OH BLOC	* *	* *		001620	DT + XVALUE3 DT + XVALUE4	
۵	DATA (((XVALUE(1,J)K))=1,8),K=1,2),J=1,9) DUMMY SLOTS FOR HOMINAL RESPONSE TIMES	SLUE(I)	J,K), I=	1,8),K=	1,2), JE	1,9) / INES			001640	DT+XVALUE5	
П С	8*0.								001660	DI+XVALUE7	
J	DESIGN	DESIGNATOR TYPES	es.						001670	DT + XVALUE8	
- 1	1.,	2.,	3.3	540.					001690	DI+XVALUIO	
2	TARGET	VELOCITIES	TTE C	34 B					001700	DT+XVALU11	
-	2.9	3.3	5.3	8.9	ċ	3*0.			001720	PI+XVALUIS PI+XVALUIS	
~	0.0 GUN-TA	O., O., 1.	4.15.15.15.15.15.15.15.15.15.15.15.15.15.	2.,	2.,	3*8.5			001730	DT+XVALU14	
-	8	12.,	20.0	30.,	40.	10.	16.,	0.0	001750	DI+XVALU16	
2	0.0	1.,		3.,	4.,	5.3	6.9	я.,	001760	DT+XVALU17	
г	.05,	.05, .10;	. 20•	30.	* *0* *				001770	DI+XVALU18	
~	0.0		2.,	3.5	4*8.				001790	DI+XVALU20	
-	AMGLES	۲ بر	000	47	ć	•	4		001800	DT+XVALU21	
٠,	0.0	1:3	2.0.5	6.6		1,00	2 * O * 5		001810	DI + X VAL UZZ	
	DEFLEC	DEFLECTION BIASES	15ES		•		•		001830	DI+XVALU24	
н с	-200.	-200., -100.,		100.	200.5				001840	DI+XVALU25	
J.	TARGET	HEADINGS	35	3.9	.	3*8.9			001850	DT + XVALU26	
Н,	-60.			30.,	6000	3#0.9			001870	DT+XVALU28	
7	SEEKED	U., I., Z., S., SEFKED SENSITIUTITES	2.,	3.,	4.,	3#8.3			001880	DT+XVALU29	
	THE FOLLOW	ING CAP.D	CONTA	INS FALS	E SEEK!	P. SENST	TIVITY	SECULOWING CARD CONTAINS FALSE SERVER SENSITIVITY VALUES IN	001890	D1 + X V A L U 3 U	
		UDING CL	ASSIFI.	ED HUMBE	RS IN	THE PRICE	RAM LIS	TING.	001010	DT+XVALU32	
	THE COPPEC	T VALUES	SHUIT	D BE RES	STORED 1	AHEN PUN	MING IN	CORRECT VALUES SHOULD BE RESTORED WHEN PUNNING IN A SECURE		DT+XVALU33	
CSFC PI	LAVIROTAMENT. RUNS DOME WITH THESE FALSE VALUES ARE FOR PURPOSES DNLY.	T. RIMS NLY.	DOME	WITH THE	SF FAL:	SE VALUE	S ARE F	OP EXAMPLE	001930	DI+XVALU34	
, i	24.9	36.,	48.	60.09	72.1	3+0.,			001950	DT+XVALU36	
2	0.0	1.,	2.,	3.3	4.3	3*8./			001960	DT+XVALU37	
ū	END								005269	BO-8DAT209	

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 8 0F 82)

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TN-F PR CN T 2
TN-F PR CN T 3
TN-F PR CN T 5
TN-F PR CN T 5
TN-F PR CN T 7
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TN-F PR CN T 9
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FN-FPRCN15
FN-FPRCN16
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FN-FPRCN19
FN-FPRCN20
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FN-FPRCN27
FN-FPRCN28
                                                                                                                                                                                                                                                                                                                                                                                                                              FN-FPRCN29
FN-FPPCN30
FN-FPRCN31
                                                                                                                                                                                                                                                                                                                              FN-FPRCN23
FN-FPRCN23
FN-FPRCN24
FN-FPRCN25
                                                                                                                                                                                      FN-FPPCN12
FN-FPRCN13
                                            005580
005590
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                                                                                                                                                                                                                                                                                                                                                                                                                                                           005870
                                                                                                                                                                                                                                                    IF (XIN.LT.O.) XRUT=10H UNOFF
IF (0.0.LE.XIN.AND.XIN.LT.10O.) ENCYDE (10,150,XRUT) XIN
IF (XIN.GE.10O.) XRUT=10H 100.03
FPRCNT=XRUT
                                                                                                                                              If (XIN.LT.0.0) XRUI=6NUNDEF)

If (0.0.LE.XIN.AND.XIN.LT.1.) ENCOOE (6.120,XDUT) XIN

IF (1..LE.XIN.AND.XIN.LT.10.) ENCODE (7.130,XRUT) XIN

IF (10.LE.XIN.AND.XIN.LT.100.) ENCODE (7.140,XRUT) XIN

IF (XIN.GE.100.) XBUT=7H100.02)

EPRCHI=XBUT

GO IN 110
                                                                                                 IF (XIN, GE, 100, 05) STOP • IN FPRCHT: EPROR HUMBER 1 • IF (, MOT., PAREH) GO TO 100
                                                                                                                                                                                                                                                                                                                                                                          STATEMENTS
                                               FUNCTION FPECNT (XIN, PAPEN)
                                                                                                                                                                                                                                                                                                                                                                                                       120 FORMAT (140,F3,2,2H%))
130 FORMAT (F4.2,2H%))
140 FORMAT (F5.2,2H%))
150 FORMAT (4X,F5.2,1H%)
                                                                                                                                                                                                                                                                                                                                                                             * * * FORMAT
                                                                             LUGICAL PAREN
                                                                                                                                                                                                                                                                                                                                   110 RETURN
                                                                                                                                                                                                                                                                 100
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LISTENG D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 9 OF 82)

FUNCTION GAMMA (ALPHA) IPN)	002200	FN-GAMMA 2	
DIMENSION WK(6), F(1)	005910	FN-GAMMA 3	
IN=1	005920	FN-GAMMA 4	
CALL GGAMA (IRN, AL PHA, IN, WK, R)	005930	FN-GAMMA 5	
GAMMA=P(1)	005940	FN-GAMMA 6	
RETURN	005950	FN-GAMMA 7	
EBD	005000	EM-GAMMA B	

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 10 OF 82)

TUNCTION IOCUIAE (A.M.) I COMMON CHARGE STANDARD STANDARD STANDARD STANDARD STANDARD CHARGE STANDARD S	3456789 3456789 005980 000970 000970 0006010	1234567890 FN-10CHAR3 CM+5YM80L3 CM+5YM80L3 CM+5YM80L3 CM+5YM80L3 FN-10CHAR3 FN-10CHAR3 FN-10CHAR3 FN-10CHAR3 FN-10CHAR3 FN-10CHAL3 FN-10C	(READ VERTICALLY)
150 IDCHAR*6 RETURN F.MO	006260 006270 006280 006290	FN-10CHA30 FN-10CHA31 FN-1DCHA32 FN-10CHA33	

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D (PAGE 11 OF 82)

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FN-NUMRIZS
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FN-NUMRI36
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FN-NUMRI38
FN-NUMRI39
FN-NUMRI40
FN-NUMRI41
                                       FN-NUMRIC2
FN-NUMRIC3
CH+SYM80L2
CH+SYM80L3
FN-NUMRIC5
FN-NUMRIC5
                                                                                                                                                                                                                                                                                           FN-NUMRI20
FN-NUMRI21
FN-NUMRI22
                                                                                                                                                                                                                                                                                                                                                                                                                                                  FN-NUMRI32
FN-NUMRI33
                                                                                                                                                                                    FN-NUMRI12
FN-NUMRI13
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FN-NUMRI15
                                                                                                                      FN-NUMRIC7
                                                                                                                                  FN-NUMRIC8
                                                                                                                                              FN-NUMRIC9
                                                                                                                                                           FN-NUMRI10
                                                                                                                                                                                                                                                      FN-NUMRI17
                                                                                                                                                                                                                                                                   FN-NUMRI18
                                                                                                                                                                                                                                                                              FN-NUMRI 19
                                                                                                                                                                        FN-NUMRI11
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          006640
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         160 FORMAT (80A1)
170 FORMAT (14 ,174 IN HUMEIC. LINE,13,30H HAD TOO MANY DECIMAL POINTO06660
15 :,/(1,8A10))
18 :,/(1,8A10)
190 FORMAT (80A1)
190 FORMAT (14 ,174 IN NUMEIC. LINE,13,49H EXCEEDS ALLOWARLE FIELD WIO06690
101 FOR HUMERIC DATA :,/(1X,8A10))
                                       006310
006320
000970
                                                                                           006340
006350
                                                                                                                                                                                                                                                                                                                    006510
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                                                                                                                                                                                                                                                                   006470
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                                                                                                                                                                                                                                                                                            006490
                                                                  COMMON /SYMBOL/ ALANK, DECPNT, ALFOFT(27), ANUMBR(11), SEP(5),
                                                                                                                                                                                                                                                      IF (IDCHE, HE. 2) GO TO 130
IF (DECFLG, EQ. 4.0) GO TO 120
WRIF (6,1770) IS, (GO TI, 12), II=1, NI), IZ=1, NZ)
STOP 'IN UUMRIC: ERPOR NUMBER I'
                                                                                                                                                                                                                                                                                                                                                                                                   NUMRIC=, TRUE,
IF (KI.LE.10) RETURN
WRITE (6,190) IB, ((B(II,IB),II=1,NI),IZ=1,NZ)
STOP * IN NUMPIC: ERROR NUMBFR 2 *
                                                                                                                                     DECFLG=0.0
DECODE (80,160,8(1,1R) )(C(IC),IC=1,80)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                STATEMENTS
                                                                                                                                                                                                                                                                                                                                                                                        ENCODE (80,180,8(1,18) )(C(1),1=1,80)
                                          LUGICAL FUNCTION NUMRIC(B, N1, N2, IR)
                                                                                                                                                                                                                                                                                                                                            IF (IDCHR.HE.3) RETURN
IF (DECFLG.HE.0.0) 60 TO 150
C(KI)=DECFNT
                                                                                                                                                                                                   IDCHR=IDCHAR(C,80,KI)
IF (IDCHR.NE.0) 60 TO 110
                                                                                  DOLLAR
DIMENSION 8(HI, H2), C(80)
                                                                                                                                                                                       (KI.GT.80) 60 TO 140
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  * * * F D P M A T
                                                                                                                       NUMP.IC = . FALSE.
                                                                                                                                                                                                                                                                                                           DECFLG=1.0
                                                                                                                                                                                                                              KI=KI+1
GD TD 100
                                                                                                                                                                                                                                                                                                                                     10 100
                                                                                                                                                                                                                                                                                                                         KI=KI+1
                                                                                                                                                                                                                                                                                                            120
                                                                                                                                                                                                                                                                                                                                                 130
                                                                                                                                                                                       100
                                                                                                                                                                                                                                                        110
                                                                                                                                                                                                                                                                                                                                                                                                     150
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LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

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FUNCTION URAN31 (1)	006730	FN-URAN312	
IF (I) 110,100,110	006740	FN-URAN313	
100 I=1111111	006750	FN-URAN314	
110 1#1	006760	FN-URAN315	
5-7-5	006770	FN-URAN316	
J=J-(J/6710R864)*6710R864	006780	FN-URAN317	
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	062900	FN-URAN318	
J=J-(J/67108864)*67108864	008900	FN-URAN319	
T	006810	FN-URAN310	
J=J-(J/67108864)*67108864	006820	FN-URAN311	
\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	006830	FN-URAN312	
7 8 14	006840	FN-URAN313	
URAN31=A1/67108864.	00 68 50	FN-URAN314	
RETURN	006860	FN-URAN315	
END	006870	FN-URAN316	
0000000011111111112222222223333334444444444	7777777 23456789	988888889 01234567890	COLUMN NUMBERS (READ VERTICALLY)

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 13 OF 82)

007080 SR-ABRTT21

(PAGE 14 0F 82)

123	000000000111111111222222222233333334444444444	3456789	9888888889 01234567890	COLUMN NUMBERS (READ VERTICALLY)
ر	SUBPOUTINE ADOTHP	001100	007100 SR-A0018R2	
، د	COMMON /TIME/ DUPLOS, TIMHOW, TOF, TRR, TIMPA, TIMBAL	007110	SR-A00TBR3 CM+TIME 2	
ر	TIMRA=TIMRA+TBR	007130	SR-40018R5	
ں		007150		
	RETURN	007160	SR-40018R8	
ر			SR-A0018R9	
		007180	SP-4001810	
0000	0000000001111111111222222222333333334444444555555556666666666	7777777 34567890	3888888889 31234567890	COLUMN NUMBERS (READ VERTICALLY)

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D (PAGE 15 OF 82)

1234	00D00000D111111111122222222223333333444444444444	88889 COLUMN NUMBERS 8789D (READ VERTICALLY)
c	SUBROUTINE ADOTOF 007210 SR-ADDIOF3 007210 SR-ADDIOF3)TDF2)TDF3
٠ (COMMON /TIME/ OUPLOS, TIMNOW, TOF, TBR, TIMRA, TTMRAI 001D20 CM+TIME 2 DD723D SR-ADD10F5	1E 2)TOF 5
, ر		SR-ADDTOF6 SR-ADDTOF7
, ,) TDF8
د		SR-ADDTO10
1234	00D0D0D0D0111111111122222222222333333334444444444	38889 COLUMN NUMBERS 57890 (READ VERTICALLY)

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0n00000001111111111222222233333333334444444444	77777778888888888888888888888888888888	COLUMN NUMBERS (READ VERTICALLY)
SUBROUTINE APTCHY.	007300 SR-ARICHKZ	

U		007310	SR-ARTCHK3	
	COMMON /KTEST/ KTFST(20,6)	000400	CM+KTEST 2	
	COMMON /NISC/ DOARPK, POSTKL, PELIF	000540	CM+MISC 2	
	COMMON /RANDOM/ IR1, IR2, IR3, IR4, IR5, IR6, IR7, IR8, IR9, IR10,000640	210,000640	CM+RANOOM2	
,	IP11, IR12, IP13, IR14, IP15, IR16, IP17, IP18, IP19, IP20, IR21000650	IR21000650	CM+RANOGM3	
	: , IR22, IR23, IR24, IR25, IR26, IR27, IR28	099000	CM+RANDOM4	
	COMMON JRPLCTN/ KPEP, HPEP, KPF, NRF, NVFHKL	000770	CM+RPLCIN2	
U		007360	SPARTCHK8	
	PM1=URAN31(IR1)	007370	SR-ARICHK9	
Ų		007380	SR-ARICH10	
	KTEST(1, KRF)=KTEST(1, KPF)+1	007390	SR-ARTCH11	
	IF (PMI.GI.DDARPK) GO TO 100	007400	SR-ARICH12	
U		007410	SP-ARTCH13	
	IABRT=1	007420	SR-ARICH14	
	CALL ABRTIL (IAPFT)	007430	SR-ARICH15	
U		007440	SR-ARICH16	
100	100 RETURN	007450	SP-ARTCH17	
U		007460	SR-ARTCH18	
	END	007470	SR-ARICH19	
00000 12345	000000001111111111122222222223333333334444444444	5777777777 901234567890	888888889 COLUM 1234567890 (READ	UN NUMBERS D VERTICALLY)

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D (PAGE 17 OF 82)

000n000000111111111222222222333333334444444444	06666666777777777777777777777777777777	ARBBBBBBBB9 01234567890	COLUMN NUMBERS (READ VERTICALLY)
SURPINITHE RLOCKK	007490	SP-BLOCHK2 SR-BLOCHK3	
COMMON /BAIL/ BLORMS, IBAIL	000110	CM+BAIL 2	
COMMON /KTEST/ KTFST(20,6)	000400	CM+KTEST 2	
COMMON PRANCEZ DIENGS MXDRNGS VISLINS ENGNOW RFAL MXDRNG	069000	CM+RANGE 2 CM+RANGE 3	
COMMON TEPLCTN/ KREP, WREP, KPF, NRF, NVEHKL		CM+RPLCTN2	
COMMON /TARGET/ TVEL, NVEHCL, DISRVH, ITGTTP, IMUTS, ITGTPS		CM+TAPGET2	
COMMON /TIME/ DUFLOS, TIMHOW, TOF, TBR, TIMEA, TIMPAL		CM+TIME 2	
· ·	007570	SR-BLOCH10	
If (IBAIL.Eq.1) KTEST(7,KRT)=KTEST(7,KPF)+1	007580	SP-BLOCH11	
<pre>IF (IBAIL.Eq.2) KTEST(10,KPF)=KTEST(10,KPF)+1</pre>	007590	SP-BLUCH12	
IF ((DTRNG-TVEL*TIMNOW).GT.BLOPNG) GO TO 100	002400	SP-8L0CH13	
O	007610	SR-BLOCH14	
IABPT=7	007620	SR-BLOCH15	
IF (IBAIL.Eq.2) IABPT=10	001630	SP-BLOCH16	
CALL ABRITL (IABRI)	007640	SP-BLOCH17	
O	001650	SR-BLOCH1B	
100 RETURN	099200	SR-BLOCH19	
U	029200	SR-BLOCH20	
END	00 16 80	SR-BLOCH21	
000000000111111111122222222233333334444444444	,6666666777777777777777777777777777777	88B8BB8B89 01234567890	COLUMN NUMBERS (READ VERTICALLY)

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12345	ᲘᲘᲘᲘᲘᲘᲘᲘᲘᲘᲘᲘᲘᲘ 1111111222222223333333333	77777788 45678901	888888889 234567890	COLUMN NUMBERS (REAO VFRTICALLY)
* OI	SUBROUTINE CCPLOT COUNDON / PRUNOAT/ DAT, TIU, NCASE, ICCPTG, IPPTG OINFNSION CH(10) ENCODE (100,100,CM(1))NCASE,ICCPTG CALL COUNNT (CH;10,FALSE.) FALSE.) RETURN * * * F OR M A T S T A T F N E N T S * * * 100 FORMAT (1H ,20H IN CCPLOT FOR CASE ,17,14H WITH ICCPFG= ,11,23H . IND PLOT PRODUCED .)	007700 000840 000840 007740 007750 007750 007760 007780 00780 00780 00780 00780 00780 00780 00780	SR-CCPL013 CM+RUNOAT2 SR-CCPL015 SR-CCPL015 SR-CCPL017 SR-CCPL017 SR-CCPL010 SR-CCPL010 SR-CCPL010 SR-CCPL010 SR-CCPL0115 SR-CCPL015 SR-CCPL015 SR-CCPL015 SR-CCPL015 SR-CCPL015 SR-CCPL015 SR-CCPL015 SR-CCPL015 SR-CCPL015	
0000	0000000001111111111222222223333333444444455555556666666666777777778888888888	7777778 34567890	888888889 1234567890	COLUMN NUMBERS (REAO VERTICALLY)

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D (PAGE 19 OF 82)

D-21

	SUBROUTINE COMBINE (A, HI, USERC, SECONS)	007880	SR-COMMNT2	
	COMMON /COMENT/ CMFMT(13,20); COMMINE (13) 15mm 1 mms		SR-COMMNT3	
	IN 6 HUND 1 CHIEF TO THE SECTION OF		CM+CDMENT2	
	DIMENSION A(NI) INGICAL INSERC. SECONS	00.7910	SR-COMMNT6	
		00 7930	SP-COMMN17	
	IF (*MOT.USERC) SO TO 110	007950	SR-COMMITS	
		096200	SR-COMMNIO	
	IF (A(3).EQ.1H\$) GN TN 100	079700	SP-COMMN11	
	I CHNT = ICHNT+1	001990	SP-COMMN13	
	EMCUDE (120,150,CMENT(1,ICMNT))(A(I),I=3,RO) GO TO 130	008010	SP-COMMN15	
0	TE (MIDG FO OF STATE	008030	SP-COMMA17	
	WRITE (6,150) (A(I), I=4,80)	008040	SR-COMMN18	
	NTRC = MTRC+1	090800	SR-COMMN29	
		00800	SP-COMMN21	
110	IF (SLCDH3) GD TN 120	060800	SR-COMMN22	
	ICHNI=ICHNI+I ENCODE (120,170,CNFNT(1,ICMNI) 1(A/I),Iz1,10	008100	SP-COMMN24	
	60 TO 130	008110	SP-COMMN25	
120	TE (NTPC.ED.D) UPITE (6.140)	008130	SR-COMMN27	
	WRITF (6,170) (A(1), 1=1,10)	008140 008150	SP-COMMN28	
	NTRC=NTRC+1	008160	SR-COMMISS	
	10 T40	008170	SR-COMMN31	
130	IF (ICMNT.LE.20) SO TO 140	008180	SR-COMMN32	
	WRITE (6,180) (K, (CNEUT(J,K), J=1,13),K=1,21) SIOP 'III COMMIT: IOD HANN & COMMENTS.	008200	SR-COMMN34	
		008210	SP-COMMN35	
140 1	RETUPH	008530	SP-COMMN37	
		008240	SPCOMMN38	
*	* FORMAT STATEMENTS ***	008250	SR-COMMN40	
50	150 FIRMAT (121 ** 1955 ** 8041)	008270	SP-COMMN41	
9	(IHI) 5(8)15\$\$ \$\$\$), 4X, 30)[CD]]]ENTS FOR THIS	008280 008280	SP-COMMN42	
# 1		062600474463643	OFFICIAMINAS	
0.0	170 FORNAT (12H ** COPE ** , 10A10)	008310	SR-COMMN45	
=	113A10,7),7,54H THE FOLLOWING CHINENT CANSED DIVERSION OF SAFET	/, 20(1X, 12, 1X, 008320	SR-COMMN46	
2	2Y: 9 / 91X91291X913A10)	008340 008340	SALCUMBANA S	
ш	E110	008350	SP-COMMN49	

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 20 OF 82)

) (READ VERTICALLY)
0000000001111111112222222233333334444444555555555666666666777777778888888888
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SR-CREAD11
SR-CREAD12
SR-CREAD13
SR-CREAD14
                                                                                                                                                                                                                 CHWEATHR2
CH+WEATHR2
CH+WEATHR3
CM+WEATHR4
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   SR-CREAD16
SR-CREAD17
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             SP-CREAD35
                                                                                                                                               CM+RNGLOS3
CM+RSPTIM2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        SP-CREAD 26
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          SR-CREAD28
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                                                                                                                                                                                    CM+RSPIIM3
                                                                                                                                                                                                     CH+RSPTIM4
                                                                                                                                   CM+RNGLOS2
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SR-CREAD SP-CREAD
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                                                                                                           COMMON / PANDOG / TCRIT, HPLOSP, FHGPLS(10), PRRLOS(10) 000620 COMMON / PROCLOS(11), VELTBL(2,2) HPP, HPP, HPRGL, CFHGG(11,2), SEGLOS(11,11), 000740 COMMON / PREFING RAPPH(2,2) NITTIM(2,000750 COMMON / PREFING RAPPH(3,2) DETTHA(10,2), NDT, TRARRY(3,2), 000800 1 2), THEAN(2,2), FRSTH, RBAR, PRSDI, FRSVI, ALFHA(10,2), RETA(2,2), DETTHH, 000800 3 IDSGTP, RUMC, PCRNSO, PPDOW COMMON / PREFING PRCLOS, PPDOW COMMON / PRELOS, PRCLOS, PROCH (6), WNSSTO(3,3), HUMID(2), 001060 1 VIS(11), CLQUOGO), MCC, HVL, FASOL(6), WNDSPO(3,3), HUMID(2), 001060 0 01060
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                               CONNON /DODE/ DEPONT(10,3), NDFSP, NDDKIL, DOKILD
LOGICAL POKILD
COMMON /HIT/ INDEX(6,5,2), PETBL(60,10,7), DLTK(6), PKTBL(10,2),
NRHGTT, RNGITF(20), TFF(3,20,2), NRHGPS, RNGPST(10), PSTFBL(10,
                                                                                                                                                                                                                                                                                                          DIMENSIAM WDATA(193), ACODAT(161), PSFDAT(49), DESDAT(31)
DIMENSIAM RADATA(22), PEDATA(4260), PSTDAT(41), AINVOA(167)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       GU TR (100,150,200,230,260,280,340,370), ITYPF
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            WDATA(I]=0.0

READ (5,420) HCC,NVL

READ (5,430) PRCLCG,(PRCFLS(I),I=1,2)

DO 120 J=1,2

READ (5,430) (PPGCFL(I,J),I=1,11)

CONTINUE
                                                                                                                                                                                                                                                                                                                                                               EQUIVALENCE (ADATA(1), PRCLCG)
EQUIVALENCE (ACCRAT(1), MPR)
EQUIVALENCE (RSPCAT(1), DEDRIKL(1))
EQUIVALENCE (DESDAT(1), DEDGKL(1))
EQUIVALENCE (RODATA(1), TCRIT)
EQUIVALENCE (PEDATA(1), MRMSPS)
EQUIVALENCE (PEDATA(1), MRMSPS)
EQUIVALENCE (ATHVPA(1), DLTT(1))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     READ (5,430) (WNDSPD(I,J),I=1,3)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               READ (5,430) (VIS(I),I=1,NVL)
READ (5,430) (CLUUO(I),I=1,NCC)
READ (5,430) (PASOL(I),I=1,6)
DN 140 J=1,3
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               READ (5,430) (W(I, J,K),I=1,MCC) CONTINUE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               READ (5,430) (HUMID(1),1=1,2)
GO TO 410
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        DIMFHSION A(80), B(8,10)
      SUBROUTINE CREAD (IT2)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                DU 110 I=1,193
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   DG 130 K=1,2
DG 130 J=1,11
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ITYPE=1T2-20
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LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D (PAGE 21 OF 82)

150 DU		008710	SP-CREA036	
	00 160 I=1,161	008720	SR-CPEA037	
		008730	SR-CREAD38	
34 S	READ (5,440) HRP, HPP, HRHGCL	008740	SP-CREA039	
7. R	NR NGCB *NRHGCL+1	008750	COLLEGE	
00	DU 170 J=1,2	008760	70-70-4040	
RE.	EAD (5,460) (CRNGO(1,1), T=1,NRP)	00.000	THOME AND THE	
170 CD		008770	SK-CKEA042	
2	DD 180 1=1.NONCC	008/800	SK-CREA043	
2 6		008790	SR-CREAD44	
	FEAU (SEGLUS(19J) 9 [= 19NPP]	008800	SR-CREAD45	
100 001	I INCE	008810	SR-CREAD46	
RE/	EAD (5,460) (RHGCLB(I),I=1,HPNGCL)	008820	CD-CDEADA7	
00	00 190 J=1,2	008830	0.0010000000000000000000000000000000000	
R.F.	READ (5.460) (VE) TB/ (1.1).1-1.2)	00000	SE-CREAU46	
100 CD		008840	SR-CREAD49	
		008820	SR-CREA050	
	OI+ DI	008860	SP-CREA051	
		008870	SP-CDEADS	
200 DN	DN 210 I=1,49	00000	20212	
210 RSF	RSPDAT(1)=0.0	000000	SKTCKEAUSS	
PF	PEAN (5.450) MOT	069900	SK-CKEA054	
2	22. 1. 1. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2.	008800	SR-CREAD55	
2 6		008910	SR-CREA056	
	CEAU (OF I MA(193)) I = 19 NOT)	008920	SR-CREA057	
220 CU		00000	2000	
RE/	READ (5,460) (BATRIM(I) I=1,3) CXNVAOF (I) I=1,3)	000000	35 1 5 F AU 28	
4		00840	SR-CREAD59	
,	1 (3) 1001 ((603F10) 121 121 121 121 121 121 101 101 101 101	008620	SR-CREAD60	
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7 4 2	EF AU (23460) ((TMEAN(133))1=122)5((TSIGHA(133))1=122)5U=13	026800	SR-CREAD62	
1 2)		008980	SP-CPEANA2	
RE	READ (5,460) ((TRARRY(I,J),I=1,3),J=1,2)	30000	2014140100	
U9	TR 410	0.000	SK-CKEAUD4	
		000600	SK-CKEAD65	
230	DU 240 1=1,21	00000	SR-CREAD66	
	10 01 11 11 11 11 11 11 11 11 11 11 11 1	020600	SR-CREAD67	
C 10 04 3	01304 1134040	000000	SR-CREADAR	
KH.	KEAU (5,450) NOFSP		SR-CREAD69	
2	DN 250 J=1,3		00 C C C C C C C C C C C C C C C C C C	
A E A	READ (5,460) (DEDOK) (1,1) 1=1. NOTCD)		ひと ひと じょうしょう	
250 CON	CONTRICT		SR-CREAD71	
		020600	SR-CREAD72	
5	0.410	080600	SR-CREAD73	
		00000	20-00-00	
	DN 270 I≠1,22		37 CACA014	
270 PUD	174(1)=0	00.1600	SK-CKEAU75	
		009110	SR-CREAD76	
K.L.A	Control NICOSP	000120	SP-CREA077	
REA	READ (5,460) TCRIT	02.1000	000000000000000000000000000000000000000	
P.E.A) (5.460) (PMCP) ((1).1-3-MP) GCB (007400	STICKEAUS	
4 4	DEAN AS A CONTRACT TO THE TANK	009140	SR-CREA079	
4 1 1	THE TOTAL OF THE TIME TO THE TRANSPORT OF THE TRANSPORT O	009150	SR-CREADRO	
5	10 410		1004	
			CKEAUGI	
	DB 200 1-1.4240		SP-CREAD82	
	002461=1 04	009180	SR-CREADB3	
	P* 0A A 1 = 0 • 0	00100	SP-CREADRA	
ISI	IONI 1=5	000000	100 V 100 T 00	
REA	READ (5,490) (A(I), 1=1,80)	00.7500	CONTRACO CONTRACO	
CAL	SEPREC (A.BO. B. B. 10)	017500	OK-ICKEAUND	
L	1	11775.00	SK-CKEADB7	
	THE STATE OF STATE OF THE STATE	009230	SP-CREA088	
Tul	4=11111	009240	SP-CREADRO	

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 22 OF 82)

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SP-CPEA104
SP-CREA105
SR-CREA106
SR-CPEA107
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SP-CPEA109
                                                                                                                                                                                                                                                                        SR-CPEA116
SR-CPEA117
                                                                                                                                                                                                                                                                                                                                                                                                                                                     SP-CREA133
SR-CPEA134
SR-CREAD90
SR-CPEA091
SR-CREA092
SP-CREA093
SR-CREA094
SP-CREA096
SP-CREA096
                                                                                                     SR-CPEA100
SR-CPEA101
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SP-CREA113
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SP-CREA115
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PEAD (5,450) NRHGTT
DO 300 J=1,NRHGTT
EAD (5,460) RHGTTF(J),((TTF(I,J,K),K=1,2),I=1,3)
COMTINUE
      GO TO 310
ENCOME (20,490,8(1,1) )(A(1),1=1,20)
GOEGNE (20,470,B(1,1) )(IMDEX(1,1,K),K=1,2)
CONTINUE
                                                                                                                                                                   340 DN 350 I=1,41
350 PSTDAT(1)=0.0
READ (5,450) HRHGPS
READ (5,460) (RHGPST(1),I=1,HRHGPS)
00 360 J=1,3
READ (5,460) (PSTTBL(1,J),I=1,HPHGPS)
360 CHHTHUE
GD TN 410
                                                                                                                                                                                                                                                                                                                                                                                                                         STATEMENTS
                                         00 320 I=1,6
ISTART=1
IF (I.Eq.1.ANG.IUNIT.EQ.5) ISTART=2
DO 320 J=ISTART,5
READ (IUNIT.470) (INDEX(I.J.)K).K=1,2)
CONTINUE
                                                                                                    00 330 I=1,60
00 330 J=1,10
PEAD (IUNIT,480) (PETBL(I,J,K),K=1,7)
CONTINUE
                                                                                                                                                                                                                                                                                                                          READ (53,460) (DLTI(I),I=1,6)
DO 400 J=1,2
READ (5,460) (PKTBL(I,J),I=1,7)
400 CONTINUE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                (ZI10)
(7F10.5)
(80A1)
                                                                                                                                                                                                                                                                                                                                                                                                                                                         (8F10.4)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                               (I5)
(8F10.4)
                                                                                                                                                                                                                                                                                                                                                                                                                          *** FORMAT
                                                                                                                                                                                                                                                                 370 00 380 I=1,167
380 AINVDA(I)=0.0
                                                                                                                                                                                                                                                                                                                                                                                                                                                 (212)
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(PAGE 23 OF 82)

0000000001111111112222223333333333334444444455555556666666666	17777777	8888888889 0123456 7 890	COLUMN NUMBFRS (READ VERTICALLY)
SUBROUTINE DETCTH	009770	SP-DETCINZ	
COMMON /FLAG/ FNDREP, ION, IPRFPL, IDIGTL, IPPTY, IRNDOC, IT3FLG, . ENDFLG		CM+FLAG 2	
LUGICAL ENDFLG, ENDREP	000310	CM+FLAG 3	
COMMON /KTEST/ KTEST(20,6)	.000490	CM+KTEST 2	
CUMMON /KANDUN/ IKL, IKZ, IP3, IR4, IR5, IR6, IR7, IR8, IP9, IR10,000640 IP11, IP12, IP13, IP14, IP1K, IP1K, IP17, IP18, IP18, IP18	00000	CM+RANDOM2	
1822, 1823, 1824, 1825, 1826, 1827, 1828	0000650	CM+RANDOM3 CM+RANDOM4	
COMMON /RPLCTN/ RREP, NPFP, KRF, NRF, NVEHKL	000770	CM+RPLCTN2	
CUMPUN (XSFILM) BATRIM(3), XHVADF(2), DUMI, BCSPTH(2,2), XHTTIM(2,000790	062000	CM+RSP TIM2	
PROPING TERRE, DECET, DECUT, ALDIAGOUS ACTAGO OF PROPING TERREY(352),	000000	CM+RSPTIM3	
IDSGIP, RUMC, PCRMSG, PRODU	000810	CM+RSPTIM4	
COMMON /TIME/ DUELOS, TIMNON, TOF, TBR, TIMRA, TIMRAI	001020	CM+TIME 2	
	009850	SP-DETCT10	
CALL SMPLCD (RETTMA,10,2,2,10,1P8,DETTIM,ICLASS)	009860	SR-DETCT11	
TE (TBNIAM EQ 1) CO TE 100	00 98 70	SR-DETCT12	
זו וועורטוריבעידו פון וון זמר	009880	SR-DETCT13	
KTEST(4,KRF)=KTEST(4,KRF)+1	068600	SR-DETCT14	
IF (DETTIM.LT.DUR.LOS) GO TO 100	004400	SR-DETCT16	
7.70047	009920	SR-DETCT17	
1,407.114	066600	SR-DETCT18	
CALL ADRILL VIADRIL	096600	SR-DETCT19	
RETIREM	009950	SR-DETCT20	
END	0099600	SR-DETCT21	
	074400	SF-0E10122	
000000000111111111122222222223333333334444444555555556666666666	7777778 34567890	088888889 1234567890	COLUMN NUMBERS (READ VERTICALLY)

(PAGE 24 OF 82)

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COLUMN NUMBERS (RFAD VERTICALLY)
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                                                                                                                     COHNON JOVALUE/ D(70), DPRT, DDT, DIDN, DIDIGT, DSMK(2)
COHMON JEUNDAT/ DAT, TIM, HCASF, ICCPFG, IPPFG
                                                                                                                                                                                                                                                                                                                                       D(16)=1.

D(17)=1.

D(21)=10HJUH1400021

D(22)=10HRSPDAT0122

D(23)=10HRSPDAT0124

D(27)=10HRSPDAT0124

D(27)=10HRSPDAT0124

D(27)=10HRSPDAT0124

D(31)=0.0

D(41)=0.0

D(43)=0.0

D(43)=0.0

D(45)=3.

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DSMK(2)=846.
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D(62)=.975
DPRT=0.0
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DIDIGT=1.
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LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

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LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

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DO 100 I=1.NDFSP
IF (OFDOKL(1,1).LE.RHGHMW.AND.RNGHDW.LT.DFDOKL(1+1,1)) GO TO 110
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     FPAC=(PHGNOW-DFD7KL(1,1))/(DFD7KL(1+1,1)-DFD7KL(1,1))
PDGSUP-DFDGKL(1,2)+FRAC*(DFDGKL(1+1,2)-DFDGKL(1,2))
PDGKLL=DFDGKL(1,3)+FRAC*(DFDGKL(1+1,3)-DFDGKL(1,3))
                                                                                                                                                                                                                                 CONMON /DODF/ DEDOKL(10,3), NDFSP, NDOKIL, DOKILD
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IF (RNIS,GT.(PDGSUP+PDGKIL)) GO TO 130
IF (RNIS,GT.PDGKIL) GO TO 120
NDGKILNDGKIL+1
DOKILD=.TRUE.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         STOP ' IN DECHK: FRROR NUMBER 1 "
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IF (DOKILD) GO TO 120
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CALL ABRTTL (IABRT)
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LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 27 OF 82)

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	_	CM+KTEST 2	
	000540 IR5, IR6, 1R7, 1R8, IR9, IR10,000640	CH+MISC 2 CH+PANOGRA	
		CM+RANDOM3	
	099000	CM+RANDOM4	
ن		CM+RPLCTN2	
,		UST 8	
ر	011020	UST o	
•		SR-0UST 10	
	011040	UST 11	
ن	011050	SR-DUST 12	
•		JST 13	
	9TT1 (1ABBT) 011070	JST 14	
U	011080	JST 15	
9	100 PETIPN 011090 SR-DUST	JST 16	
	011100	JST 17	
د		SR-0UST 18	
	011120	SR-0UST 19	
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                                              COMMON /BAIL/ BLORNG, IBAIL
COMMON /DODY/ DEDOKL(10,3), NDFSP, NDOKIL, DOKILD
LOGICAL OUKILD
COMMON /FLAG/ ENDREP, IDN, IPPEPL, IDIGIL, IPPIY, IRNDOC, IT3F1G,
1 ENDFLG
                                                                                                                                                             LOGICAL ENDELG, FNDREP PETBL(60,10,7), DLIT(6), PKTBL(10,2), CRHWIN /HIT/ INDEX(6,5,2), PETBL(60,10,7), DLIT(6), PSTTBL(10, 10, 10,10), PSTTBL(10, 2, 3)
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                                                                                                                                                                                                                                                         COMMON /LOGFLG/ FIRSTL, SFONML, SPCL(70), SHRTEC, FTSILL LOGICAL FIPSTL, SEONML, SPCL, SHRTEC, FTSILL COMMON /MISC/ DOAPPK, PDSIPM, PELIF COMMON /OVER/ INVER(70)
                                                                                                                                                                                                                                                                                                                                                          COMMON PREDESCI ANGLET, GTRUG, RFFL, DEFB, TGTHD, SKSFN COMMON PANDOCI TERIT, NPLOSE, RMGPLS(10), PRBLGS(10) CQHHOH PRANGFI DIPNG, MXDRUG, VISLIM, RNGNOW
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(WCf SUR(I), I=1,2), (WSUM(I), I=1,2)
(PASOL(I), I=1,6)
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TVIL, + HVELHCL, OISBVH, ITGITP
PCLCG, (PRCTLS(I), I=1, 2)
((PPGCFL(I, J), I=1, 11), J=1, 2)
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NSMK2, NSMK5
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LISTING D-1 FORTRAN LISTING OF COPE PROGRAM (PAGE 29 OF 82)

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WRITE (IUNIT, 220) (DLT(I),I=1,6) (1180)
WRITE (IUNIT, 220) (RNGTBL(I,J),I=1,10), (RRITE (IUNIT, 220) (RNGTST(I),I=1,10) (RRITE (IUNIT, 280) (RNGTST(I),I=1,10) (RRITE (IUNIT, 280) (RNGTST(I),I=1,10) (RRITE (IUNIT, 280) (RNGTST(I),I=1,10) (RRITE (IUNIT, 280) (RNGTST(I),I=1,10) (RRITE (IUNIT, 280) (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I=1,2), (RNGTST(I),I
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011940
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               011870 (IUNIT, 220) ((THEAN(1, J), I=1,2), J=1,2), ((TSIGHA(1, J), I=1,2), 011880
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WRITE (IUHIT,220) ((ALPHA(1,J),I=1,2),J=1,2),((BETA(1,J),I=1,2),
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       WRITE (IUNIT, 280) ((TPARRY(I,J)) I=1,10), J=1,2)
WRITE (IUNIT, 280) ((TPARRY(I,J)) I=1,3), J=1,2)
WRITE (IUNIT, 220) PESTH, TRBAP, PRSOT, PRSUT, PCPHSG, PRODW, RUMC
WRITE (IUNIT, 210) IDSGTP
IF (IPNDIC, 69,0) GO TO 170
WRITE (IUNIT, 220) TOPIT
                                                                                                                                                                                               IOH, IPREPL, IDIGTL, IPRTY, IRHDOC, IT3FLG
BLORNG
                                                                                                                                                                                                              WRITE (IUNIT, 210) 104, IPREPL, IDIGIL, IPRIV, IRHDGC, IT38 WPITE (IUNIT, 220) BLORNG WRITE (IUNIT, 250) GLOBOMK(I,J), I=L103,J=1,3) WRITE (IUNIT, 250) ANGLET, GTRNG, PEFL, OFFR TGTNM, SKSEN IF (IOVER(26),NE,2) WRITE (IUNIT, 180) PECODE IF (IOVER(26),Eq.2) WRITE (IUNIT,190) OF IT (IOVER(26),Eq.2) WRITE (IUNIT,190)
WEITE (IUHIT, 220) (WHDSPO(1, J), 1=1,3)
CONTINUE
WPITE (IUNIT, 220) (HUMID(I), I=1,2)
WPITE (IUNIT, 240) (CRIGO(1, J), I=1,1)
WRITE (IUNIT, 240) (CRIGO(1, J), I=1,1), J=1,2)
WRITE (IUNIT, 240) (RGCLB(I, J), I=1,1), J=1,1)
WRITE (IUNIT, 240) (WCLTR((1, J), I=1,1)
WRITE (IUNIT, 220) (WCLTR((1, J), I=1,2)
CONTINUE
                                                                                                                                                                                                                                                                                                                                                                                                                                 DO 140 1=1,60
WRITE (IUNIT,270) 1,((PFTBL(1,J,K),K=1,7),J=1,10)
CONTINUE
                                                                                                                                                                                                                                                                                                                                                                                   WRITE (IUNIT, 260) I, ((INDEX(1, J, K), K=1,2), J=1,5)
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          WRITE (IUNIT,210) MPLOSE
WRITE (IUNIT,280) (RNGPLS(I),I=1,10)
WRITE (IUNIT,280) (PRBLOS(I),I=1,10)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    WRITE (IUNIT, 210) NRHGTT
DO 160 J=1,20
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WRITE (I
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LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

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SR-FINDI51
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SR-FINDII9
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       SR-FINOI54
                                                                                                       SP-FINOIT9
                                                                                                                     SR-FINDIIO
                                                                                                                                                          SR-FINDI13
SP-FINDI14
                                                                                                                                                                                   SP-FINDI15
                                                                                                                                                                                                              SP-FINDI17
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                                                                              CH+SYMBOL2
                                                                                         CH+SYMBOL3
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                         COMMON /ICODE/ ICODE
COMMON /ICODE/ ICODE
COMMON /INDEXI/ INDXIICOOI)
COMMON /PUNDAT/ DAT, TIM, HCASE, ICCPEG, IPPFG
COMMON /SYMBOL/ BLANK, DECPHT, ALFBET(27), ANUMRP(11), SEP(5),
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        IF (IT(1),LT.6.0F.IT(1),GT.8) GU TO 160
If (ITRY-EQ.0.DR.20.LT.11(2),AND.IT(2),LE.30)) GU TO 150
WPITE (6,230) (8(2,JK),JK=1,HI2),IT(2),CHAR(3,IMATCH1)
STOP * IN FINDIT: EPENR HUMBEP 2 *
                                                                                                                                                                                                                                                                                                                                                                                                                                                                  WRITE (6,240) IB, ((B(I1,12), I1=1,41), I2=1,42)
STOP * IN FINDIT: ERROR HUNGER 1 *
                                                                                                                                                                                                                                                                                                                                                             DG 120 J=1,8
IF (8(J,18),HE.CHAF(J+2,1)) GG TG 130
CONTINUE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   IF (CHAR(2,1MATCH), FQ.O.O) GO TO 210
ICHNL=CHAR(2,1MATCH)
   SUBPROUTINE FINDIT (8, HI, HZ, IT, H3)
                                                                                                                                  DINENSION 8(H1, N2), IT(N3)
DIMFHSION CHARA(10, 30), IPAY(6)
                                                                                                                                                                          EQUIVALENCE (ICODE , CODE)
                                                                                                                                                                                                                          IRAY(1)=0
IRAY(5)=LOCF(NOREC)
CALL SYSTEMC (104,IPAY)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        IF (ITRY.EQ.1) RETURN
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           CODE=CHAR(3, INATCH)
                                                                                                                                                                                                                                                                                                                                                                                                   IT (IB) = CHAR(1, I)
                                                                                                                                                                                                                                                                                                                                               DO I3D I=1,NREC
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   IN AT CILL = IMATCH
                                                                                                          EXTERNAL NORFC
                                                                                                                                                                                                   LUGICAL NUMRIC
                                                                                                                                                                                                                                                                                 00 100 I=1, N3
                                                                                                                                                                                                                                                                                                                                                                                                                           GO TO 140
CONTINUE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ICHRPL=300
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Gn Tn 110
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       IT1=IT(1)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              CONTINUE
                                                                                                                                                                                                                                                                                                                                                                                                                I MAT CH= I
                                                                                                                                                                                                                                                                                              IT(I)=1
                                                                                                                                                                                                                                                                                                                                     ITRY=0
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       I TPY=1
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82)

(READ VEPTICALLY) COLUMN NUMBERS

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SR-FINO168
SR-FINO168
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   SR-FINO155
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            230 FORMAT (1H ,21H IN FINOIT, KEYWORD: ,8A10,1,32H ANO CORRESPONDING 1VALUE OF IT: ,13,26H ARE NOT ALLOWED WITH THE ,A10,8H OPTION ) 240 FORMAT (1H ,39H IN FIMOIT, NO MATCH FOUND FOR LINF IB*,13,19H OF I IN S ARRAY: ,/,(IX,8A10))
IF (CHAR(1, IMATCH), EQ.CHAR(1, IMATCH+1)) CODF=CHAR(3, IMATCH+1)
CALL READMS (11, CHARA, ICHRFL, ICNDF)
IHANDP=12.
IF (81, 1): EQ. BLAHK) GO TO 700
FO 180 K=1, ICHNL
FI (1.NE.IFIX(CHARA(2, K))) GO TO 180
OO 170 J=1.8
FI (1.NE.CHARA(3, K)) GO TO 180
FO 180 K=1, READMA(1, K)) GO TO 180
FO 180 K=1, READMA(1, K)) GO TO 180
FO 180 K=1, READMA(1, K) GO TO 180
FO 180 K=1, READMA(1, K) GO TO 180
FO 180 K=1, READMA(1, K) GO TO 180
FO 180 K=1, READMA(1, K) GO TO 180
                                                                                                                                                                                                                    IF (NUMRIC(B,NI),N2,IB)) 60 TO 190
WRITE (6,240) IB,((0(II,I2),II=1,N1),IZ=1,N2)
STOP * IN FINOIT: ERROR HUMBER 3 *
                                                                                                                                                                                                                                                                                                                                                                                                                     220 WRITE (6,240) IB, ((B(I1,I2),I1=1,II),I2=1,N2)
STOP ' IN FINDIT: FREAR HUMBER 4 '
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 STATEMENTS * * *
                                                                                                                                                                                                                                                                                                                                                  IF (B(1,18),EQ.8LANK) PETURN
IF (,NOT.NUMRIC(B,M1,M2,IR)) GO TO 220
IT(IB)=0
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   *** FORMAT
                                                                                                                                                         IT(I)=CHARA(1,K)
GO TO 200
                                                                                                                                                                                          CONTINUE
                                                                                                                                                                                                                                                                                  190 IT(IB)=0
                                                                                                                                                                                                                                                                                                200 CONTINUE
                                                                                                                                             CUNTINUE
                                                                                                                                                                                                                                                                                                                            RETURN
                                                                                                                                                                                                                                                                                                                                                                                                          RETURN
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LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 33 OF 82)

000000 12345	00000000011111111112222222233333333344444444555555556666666666	7777778 34567890	888888889 1234567890	COLUMN NUMBERS (REAO VEPTICALLY)
	SURPOUTINE GETRIG		SP-GETPNG2	
U			SR-GETRNG3	
	COMMON PEANDOMY IPLY IRES, IFES, IRES, IRES, IPPS, IPPS, IPPS, 1910,000640	000640	CM+RANDOM2	
	I TRILLY INICA FELSA INICA FILSA INICA INI	000000	CM+RANDOM3	
	Z 9 IRZZ9 IRZZ9 IRZZ9 IRZS9 IRZ69 IRZ79 IRZ8	000660	CM+RANOOM4	
	COMMUNICATION OF THE PROPERTY	00000	CH+RANGE 2	
	KEAL IXDRIG	069000	CM+RANGE 3	
•	CHINGN ZEMELUS HEP, HPP, HEHGCL, CRHGD(11,2), SEGLOS(11,11),	000240	CH+RNGLDS2	
٠	1 RNGCLB(II), VELTBL(Z,Z)	000150	CM+RNGLUS3	
	COMMON PROCINI KREP, HREP, HPF, NPF, NVEHKL	000210	CM+RPLCTN2	
	COMMON TARGETY TVEL, MVEHICL, DISRVH, ITGTP, IMUTS, ITGTPS	00100	CH+TARGET2	
	COMMON ATTHE DUPLOS, TIMNOW, TOF, TBR, TIMPA, TIMPA1	001050	CH+TIME 2	
,	COMMON /WEATHRY PRCLCG, PRCFLS(2), FRGCFL(11,2), W(6,11,2),	001000	CM+WEATHR2	
	VISCILLY CLOUDCED, MCC, MUL, PASAL(6), WNDSPO(3,3), HUMID(2),		CM+WEATHR3	
,	z wstil(z), wcfsufi(z), icc, ivl		CM+WEATHR4	
U			SR-GETRN11	
,	CALL SMPLCO (CRHGO,11,2,2,4EP,1R6,DTRNG,1PC)		SP-GETRN12	
ں		013260	SR-GETRN13	
	OU 100 I=1, NPMGCL		SR-GETRN14	
•	IF (DTRIG-LE-RNGCLR(I)) 6D TO 110		SP-GETRN15	
100	100 CTMT ITHUE		SP-GETRN16	
; ن			SR-GETRN17	
110	110 IRDW=1+1		SR-GETRN18	
U			SR-GETRN19	
	IF (TVEL.GT.0.0) GD TO 120		SR-GETRN20	
	CALL STRACE		SR-GETRN21	
,	STOP 'IN GETRIGE TARGET VELOCITY # 0.0 .		SR-GETRN22	
ٔ			SR-GETRN23	
120	CALL SMPLCD (SEGLUS-11-11-11-11-11-11-11-1-1-1-1-1-1-1-1-		SP-GEIRN24	
,	DOKELOS = (SC GENG+1 LUA) + (NVERCL-1) *DISBVA) / IVEL		2K-6E1KN 25	
ں			SR-GETRN 26	
	עם יסאנו		SK-GEIRNZ/	
ر			SR-GEIRN28	
	END	013420	SR-GETRN29	
00000	0000000001111111112222222223333333444444445555555556666666666	87777778	888888888	COLUMN NUMBERS
123457	1234567840123436 8401234567890123456789012345678901234567890123456789012345678401234567840 (READ VERTICALLY)	34567890	1234567890	(READ VERTICALLY)

(PAGE 34 OF 82)

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SP-GETTI31
SP-GETTI32
SP-GETTI33
SP-GETTI34
SR-GETTI35
SR-GETTI35
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SR-GETT122
SP-GETT123
SR-GETT124
SR-GETT126
SR-GETT126
SR-GETT127
SP-GETT128
SR-GETT128
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SR-GE1T142
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SR-GETT144
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SR-GETT146
                                                                                                                                                                         CM+LOGFLG2
CM+LOGFLG3
CM+RANODM2
                                                                                                                                                                                                                                                                                                                                                            CM+RSPTIM3
CM+RSPTIM4
CM+RSPTIM5
                                                                                                                                                                                                                                                           CM+RANDOM3
CM+RANDOM4
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   SR-GETTI39
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                                                                                                                            CM+ESRESP2
CM+KTEST 2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             SR-GE11116
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  SP-GETTII8
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          SP-6E11119
                                                                                                                                                                                                                                                                                                             CM+RPLCIN2
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013660
                                                                                 1 ENDELG MOCLG, ENDREP CO00310 COMMON / FSRESP / FSRIG4, 2) CO00310 COMMON / FSRESP / FSRIG4, 2) COMMON / FSRESP / FSRIG4, 2) COMMON / FSRESP / FSRIG5, 5GOMED / FORTIL SEGMEN, 5FCH, 5HREC, FISILL CO00360 COMMON / LOGEGGG / FRSTL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 5FCHIL, 
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                                            COMMON /FLAG/ ENDREP, IDN, IPREPL, IDIGTL, IPRIY, IRNDAC, IT3ELG, ENDFLG
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      THIRD METHOD OF MODELING PESPONSE TIME (ADDING CONTRIBUTIONS OF
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          FIRST NETHOD OF MODILING RESPONSE TIME (A SINGLE DISTRIBUTION)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    SECOND METHOD OF MODFLING PESPONSE TIME (A SINGLE VALUE)
                                                                                                                                                                                                                                                                                                                                                                                                                                                 COMMON /TIME/ OURLUS, TIMMOM, TOF, TBR, TIMPA, TIMRAL
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              CALL SMPLCD (ESRT:14,2,2,14,1R9,FSRTIM,IC)
TIMNOW=TIMNOW+FSPTIM
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     KTFST(8, KRF) = KTEST(8, KPF) +1
IF (EMIO.LE. PESDT) GO TO 170
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        KTEST(8,KPF)=KTEST(8,KPF)+1
IF (PHIO.LE.PPSDT) GO TO 170
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      ITIMOL=3
IF (ETSILL) ITIMDL=1
IF (PRSPTH.ME.0.0) ITIMOL=2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Gn Tn (100,110,120), ITIMDL
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            CALL AERTTL (IARPT)
GO TO 180
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     IABPT#8
Call Abrttl (IABFT)
60 TO 180
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                RH10=(PRAH31(IP.10)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   R1110=(1P.A1131 (1F.10)
     SUBPOUTINE GETTIN
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LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D (PAGE 35 OF 82)

VARIGUS DELAY COMPONENTS!

(READ VFRTICALLY)

COLUMN NUMBERS

SP-GETTI47

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COLUMN NUMBEPS (PEAD VEPTICALLY)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          SR-GETT149
SR-GETT140
SP-GETT150
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SR-GETT153
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SP-6ETTI58
SR-6ETTI59
SR-6ETTI60
SP-GETTI61
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014320
014330
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                                                                                           OPPORTUNITY
                                                                       IF INM * 1 , DAYTIME; IF IDN * 2 , HIGHT ,
IF IPPEPL * 1 , PRE-PLAHHFD; IF IPREPL * 2 , TARGET OF OPPORTUN]
IF IDIGTL * 1 , USF PMO ; IF IDIGTL * 2 , USE VOICE ,
IF IDRIY*2, PPIDRITY PPE-PLAHHED TARGET; OTHERWISE, HOT PRIORITY
                                                                                                                                                                                                                                                                                                                                                                                       IF (IDIGTL.FQ.2) GO TO 150
TIMNOW=TIMNOW+XMTTIM(ITDGTL,IPREPL)+XMVADE(IPREPL)
ITDGTL=2
                                                                                                                                                                                          ALF-ALPHA(IDN, IPREPL)
EDDIIM-BETA(IDN, IPREPL)*GAMHA(ALF, IP9)
TIMMOW-TIMMUW+EDDIIM
                                                                                                                                                                                                                                           PNIO-UEAHAI(IRIO)
IF (PNIO-GT.PRSDT) GN TN 130
IIMIOW=TINNOW+XHTTIM(ITDGTL,IPPFPL)
                                                                                                                                                                                                                                                                                                                                                                                                                                                    TIMNOW=TIMNOW+XMTTIM(ITDGTL, IPREPL)
TIMNOW*TIMNOW+BCSPTM(ITDGTL, IPPEPL)
TIMNOW=TIMNOM+BATETM(IPPEPL+IPRTY)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              170 KTEST(9, KPF)=KTEST(9, KPF)+1
PH12=URAH31(IP12)
IF (PH12-LT-PCRMSC) GN TN 180
                                                                                                                                                                                                                                                                                                           RHII=URAH31(IRII)
IF (PHII-LE.PRSVT) GO TO 140
                                                                                                                                       ITPGTL*IPIGTL
KTEST(8,KRF)=KTEST(N,KPF)+1
IF (ITPGTL*HF,1) CO TO 130
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        CHECK FOR CORPECT MESSAGE
                                                                                                                                                                                                                                                                                                                                              CALL ABRITL (IARRI)
GO TO 180
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 CALL ABRITL (IABPI)
                                                                                                                                                                                                                                                                                    TO 160
                                                                                                                                                                                                                                                                                                                                                                                                                           6n Tn 160
                                                120 CONTINUE
                                                                                                                                                                                                                                                                                                                                    IABP.T=8
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LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 36 OF 82)

0000000011111111112222222233333334444444445555555556666666677777777888888888 COLUMN NUMBERS 1234567890123456789012345678°0123456789012345678901234567890123456789012345678901234567890 (REAO VERTICALLY)

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SR-GETVI28
SR-GETVI29
SR-GETVI30
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SR-GETVI48
SR-GETVI49
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SR-GETV132
SR-GETV133
SR-GETV134
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SR-GETVI37
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SR-GETVI45
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SR-GETVI25
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SR-GETVI43
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SR-GETVIS2
SR-GETVIS3
SR-GETVIS4
SR-GETVIS5
SR-GETVIS6
CM+RANOUM2
                                                                                                     CM+PANGE 2
CM+RANGE 3
CM+RPLCTN2
CM+WEATHR2
                                                                                                                                                                                                 SR-GETVI12
SR-GETVI13
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SR-GETVI17
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                                                                             CM+RANODM3
CM+RANODM4
                                                                                                                                                                                                                          SR-GETVII4
                                                                                                                                                                                                                                        SR-GETVI15
                                                                                                                                                                                                                                                                                                                                   SR-GETVI22
                                                                                                                                                                                                                                                                                                                       SP-GETVI21
                                                                                                                                                            CM+WEATHR3
                                                                                                                                                                       CM+WEATHR4
                                                                                                                                                                                      SR-GETVI11
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                                                             СОМНОИ / ГАЛООИ/ 1Р1, 1R2, 1P3, 1P4, 1R5, 1R6, 1R7, 1R8, 1R9, 1P10,00640

1 IR11, IR12, IR23, IR4, 1R15, IP16, 1R17, IP18, IR19, IR20, IR21000650

2 , IR22, IR23, IR24, IR25, IR26, IR27, IR28

СОМНОИ / PANGE/ DTRNG, MXDRNG, VISLIM, RNGNUW

REAL MXDRNG

СОМНОИ / PRATIKI KEEP, HREP, KPF, HPF, NVEHKL

СОМНОИ / MATHER / PECLG, PRCFLS(2), PRGCFL(11,2), W(6,11,2), 001060

2 WSUM(2), WCFSUM(2), HCC, HVL, PASQL(6), WNDSPO(3,3), HUMID(2), 001070
                                                                                                                                                                                                                                                                                                           014570
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                                                     014430
                         THIS SUBROUTINE SAMPLES WEATHER DATA ARRAY TO OBTAIN CLOUD CEILING AND VISIBILITY RANGE LIMIT.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  USE W ARRAY PROBABILITIES IN SAMPLING TO OBTAIN ICC AND INL
                                                                                                                                                                                                                                                                                                                                                                           CLOWD FREE LINE-OF-SIGHT USE PROCEL ARRAY PROBABILITIES IN SAMPLING TO OBTAIN IVE SET ICC TO HAXIMUM CLOWD CFILING ALTITUDE INDEX (ICC=6)
                                                                                                                                                                                                                                                                                 THERE IS A CLIUD FREE LOS, ICFLOS=19IF MOT, ICFLOS=2
                                                                                                                                                                                                   IF THERE IS A CLOUR CELLING, ICLNGF=1; IF NOT,ICLNGF=2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  CALL STRACE
STOP ' IN GETVIS: RANDON HUNBER TPOUGLE 1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           PR=PP+PRGCFL(IJ,ICLNGF)
IF (PRI_LF,RM4.AND.RM4.LT.PR) GO TO 110
                                                                                                                                                                                                                                                                                                             RN3=URAN31(IR3)
ICFLOS=2
IF (RN3.LT.PRCFLS(ICLNGF)) ICF(.NS=1
IF (ICFLOS.E0.2) GO TO 120
                                                                                                                                                                                                                                                                                                                                                                                                                                                                            FR=0.0
PH4=URAN31(IR4)*WCFSUH(ICLHGF)
OG 100 IJ=1,NVL
                                                                                                                                                                                                                                                        IF (PN2.LT.PRCLCG) ICLHOF=1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            NO CLOUD PREC LINC-OF-SIGHT
                                                                                                                                                                                                                                                                                                                                                                                                                                                  CLDCLG=CLUUO(ICC)
        SUBROUTINE GETVIS
                                                                                                                                                                                                                                  RN2*UP.AN31 (IR2)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         110 VISLIM=VIS(IJ)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   60 TO 160
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        CONTINUE
                                                                                                                                                                                                                                                 ICLNGF=2
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LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

11, MCC 11, MC	014880 014890 014900 014910 014920 014920 014930 014940 014940 014940 014940 014940 014940 014940 014940 015020 015020 015040	VOUVUVUVUILIIIIIIZZZZZZZZZZZZZZZZZZZZZZZZZ	66777777777777 890123456789	8888888889 01234567890	COLUMN NUMBERS (READ VERTICALLY)
1.9 NCC 1.9 NCC 1.1 NC	11-11-11-11-11-11-11-11-11-11-11-11-11-	N31(IR5)*WSUM(ICLNGF)	014880	SR-GETVI51	
014900 5.J.ICLHGF) C.P.HS.AND.RNIS.LT.PP) GO TO 150 014920 014920 014930 014930 014950 014960 015000	11 11 12 12 12 12 13 14 15 15 15 15 15 15 15	I=I9 MCC	014890	SR-GETVI 52	
014910 014910 C.P.P.15.AND.R.N.S.LT.PP.) GO TO 150 014930 014940 014970 014970 014970 014970 0100(I) 000(I) 000(I) 015000 015000 015000 015000 015000 015000 015000 015000 015000 015000 015000 015000 015000 015000	11 11 12 12 12 12 13 14 15 16 17 17 17 17 17 17 18 18	1=L9 MVL	014900	SR-GETVI53	
014920 E.F.MS.AND.R.MS.LT.PP) GO TO 150 014940 014940 014940 014960 014970 014970 014970 01900 01900 01900 015010 015010 015060 015060 015060 015060 015060 015060	111111222222222233333333444444444555555556666666666		014910	SR-GETVI54	
CE 014930 014930 014940 014940 014940 014940 014960 014960 014970 014980 015000 0100(I) 0101(I) 015000 015000 015060 015060 015060 015060 015060 015060 015060 015060	014930 SR-GETV156 014930 SR-GETV156 014950 SR-GETV157 014950 SR-GETV157 014950 SR-GETV159 014970 SR-GETV169 014970 SR-GETV160 014970 SR-GETV160 014970 SR-GETV160 014970 SR-GETV160 015010 SR-GETV160 015010 SR-GETV160 015010 SR-GETV160 015010 SR-GETV160 015020 SR-GETV160 015030 SR-GETV160 015030 SR-GETV160 015030 SR-GETV160 015030 SR-GETV160 015030 SR-GETV160 015030 SR-GETV160 015030 SR-GETV160 015030 SR-GETV160 015030 SR-GETV170 015030 SR-GE		014920	SR-GETVI55	
01440 01440 01440 014460 014660 014970 014970 014970 014970 014970 015000 015010 015050 015050 015060 015060 015060 015060 015060	Part Part	•LL•PUS•AND•RN5•L1•PP) 60 TO 150	01,4930	SR-GETVI 56	
014559 014960 014970 014970 014970 015070 015070 015060 015060 015060 015060 015060 015060 015060 015060 015060	014950 SR-GETV158 RACE 11 GETV1S: RANDO'N NUMBEP TPONELE Z • 014970 SR-GETV160 014970 SR-GETV160 014970 SR-GETV160 014970 SR-GETV161 014980 SR-GETV161 014980 SR-GETV161 015010 SR-GETV162 015010 SR-GETV164 015020 SR-GETV164 015020 SR-GETV165 015030 SR-GETV166 015040 SR-GETV166 015040 SR-GETV169 015050 SR-GETV169 015050 SR-GETV169 015050 SR-GETV170 015080 SR-GETV171 015030 SR-GETV171 0150	ıı ı	014940	SR-GETVI57	
014960 014970 014970 014970 014990 015000 015010 015010 015040 015050 015060 015060 015060 015060 015060 015060	PAGE 11 GETVIS: RANDON HUMBEP TPONIBLE 2 • 014960 SR-GETVI59 12 GIVEN SR-GETVI60 13 GIVEN SR-GETVI61 14 GETVIS: RANDON HUMBEP TPONIBLE 2 • 014970 SR-GETVI62 15 GIVEN SR-GETVI63 15 GIVEN SR-GETVI63 16 GIVEN SR-GETVI64 17 GIVEN SR-GETVI64 18 GIVEN SR-GETVI64 18 GIVEN SR-GETVI66 18 GIVEN SR-GETVI66 18 GIVEN SR-GETVI69 18 GIVEN SR-GETVI69 18 GIVEN SR-GETVI69 18 GIVEN SR-GETVI69 18 GIVEN SR-GETVI69 18 GIVEN SR-GETVI70 18 GIVEN SR-GETVI70 18 GIVEN SR-GETVI70 18 GIVEN SR-GETVI70 18 GIVEN SR-GETVI70 18 GIVEN SR-GETVI70 18 GIVEN SR-GETVI70 18 GIVEN SR-GETVI70 18 GIVEN SR-GETVI70 18 GIVEN SR-GETVI70 19 GIVEN SR-GETVI70 19 GIVEN SR-GETVI70 10 GIVEN SR-GETVI70 10 GIVEN SR-GETVI70 10 GIVEN SR-GETVI70 10 GIVEN SR-GETVI70 10 GIVEN SR-GETVI70 11 GIVEN SR-GETVI70 11 GIVEN SR-GETVI70 12 GIVEN SR-GETVI70 13 GIVEN SR-GETVI70 14 GIVEN SR-GETVI70 15 GIVEN SR-GETVI70 16 GIVEN SR-GETVI70 17 GIVEN SR-GETVI70 18 GIVEN SR-GETVI70 18 GIVEN SR-GETVI70 18 GIVEN SR-GETVI70 18 GIVEN SR-GETVI70 18 GIVEN SR-GETVI70 18 GIVEN SR-GETVI70 18 GIVEN SR-GETVI70 18 GIVEN SR-GETVI70 18 GIVEN SR-GETVI70 18 GIVEN SR-GETVI70 18 GIVEN SR-GETVI70 18 GIVEN SR-GETVI70 18 GIVEN SR-GETVI70 19 GIVEN SR-GETVI70 19 GIVEN SR-GETVI70 10 GIVEN SR-GETVI70 10 GIVEN SR-GETVI70 10 GIVEN SR-GETVI70 10 GIVEN SR-GETVI70 10 GIVEN SR-GETVI70 10 GIVEN SR-GETVI70 10 GIVEN SR-GETVI70 10 GIVEN SR-GETVI70 10 GIVEN SR-GETVI70 10 GIVEN SR-GETVI70 10 GIVEN SR-GETVI70 10 GIVEN SR-GETVI70 10 GIVEN SR-GETVI70 10 GIVEN SR-GETVI70 10 GIVEN SR-GETVI70 10 GIVEN SR-GETVI70 11 GIVEN SR-GET		014950	SR-GETVI58	
014970 1 GETVIS: RAIDO'I HUNBEP TP RIBLE 2 • 014980 014980 015000 015000 015010 015040 015050 015060 015060 015060	### GETVIS: RANDON HUNBEP TPONIBLE 2 * 014970 SR-GETVI60 IN GETVIS: RANDON HUNBEP TPONIBLE 2 * 014990 SR-GETVI61 OLSOOO SR-GETVI63 CLOUD(I) CL		014960	SR-GETVI59	
5(J) 014980 014980 01500 01500 01500 01500 01501 015050 015050 015050 015050 015060 015060 015060 015060	111 CELVIS: RAMBUT MARRY TP MARLE 2		014970	SR-GETVI 60	
01499) 0100(1) 01500 01500 01500 01501 01501 01501 01501 01500 01500 01500 01500 01500	VIS(J) CLOUD(I)		014980	SR-GEIVI61	
01500 015010 015010 015020 015030 015040 015050 015060 015060 015060	015000 SR-GETV163 CLOUD(I) CLO		014990	SR-GETVI62	
01500 01502 015030 015030 015040 015050 015060 015080 015080	015010 SR-GETV164 015020 SR-GETV165 015030 SR-GETV165 015030 SR-GETV167 015030 SR-GETV167 015030 SR-GETV167 015050 SR-GETV169 015070 SR-GETV170 015080 SR-GETV171 015080 SR-GE		015000	SR-GETVI63	
015020 015030 015040 015040 015050 015080 015080	015020 SR-GETV165 015030 SR-GETV165 015040 SR-GETV166 015040 SR-GETV167 015050 SR-GETV169 015050 SR-GETV170 015050 SR-GETV170 015050 SR-GETV170 015050 SR-GETV170 015050 SR-GETV170 015050 SR-GETV170 015050 SR-GETV170 015050 SR-GETV170 015050 SR-GETV170 015050 SR-GETV170 015050 SR-GETV170 015050 SR-GETV171 015050 SR-GE	CLUUULI)	015010	SR-6ETVI 64	
015530 015040 015050 015060 015070 015080	CC 015030 SR-GETV166 015030 SR-GETV166 015030 SR-GETV166 015030 SR-GETV167 015030 SR-GETV167 015050 SR-GETV169 015050 SR-GETV169 015050 SR-GETV170 015050 SR-GETV170 015050 SR-GETV170 015030 SR-GETV170 O15030 SR-GETV170 015030 SR-GETV170 SR-GETV170 SR-GETV170 SR-GETV170 SR-GETV170 O15030 SR-GETV170 SR-GETV		015020	SR-GETVI65	
015040 015050 015050 015070 015080 015080	015040 SP-GETV167 015050 SR-GETV168 015050 SR-GETV169 015070 SR-GETV170 015070 SR-GETV170 015070 SR-GETV170 015070 SR-GETV170 015070 SR-GETV171 015070 SR-GETV171 015070 SR-GETV171 015070 SR-GETV171 015070 SR-GETV171 015070 SR-GETV171 015070 SR-GETV171 015070 SR-GETV171 015070 SR-GETV171 015070 SR-GETV171 015070 SR-GETV171 015070 SR-GETV171 015070 SR-GETV171 015070 SR-GETV171 015070 SR-GETV171 015070 SR-GETV171 015070 SR-GETV171 015070 SR-GETV169 015070 SR-GETV169 015070 SR-GETV169 015070 SR-GETV169 015070 SR-GETV169 015070 SR-GETV169 015070 SR-GETV169 015070 SR-GETV170 015070 SR-GE		015030	SR-GETVI66	
015050 015060 015070 015080 015080	015050 SR-GETVI68 015050 SR-GETVI69 015070 SR-GETVI70 015080 SR-GETVI71 01502222222222223333333444444444444455555556666666666		015040	SP-GETVI67	
	015060 SR-GETV169 015070 SR-GETV170 015080 SR-GETV171 015020 SR-GETV172 11111122222222233333334444444445555556666666666	رر	015050	SR-GETVI68	
	015070 SR-GETV170 015080 SR-GETV171 015090 SR-GETV172 111111222222222222333333344444444444455555566666666677777777888888889 COLUHN NUH8ERS 4507890123456789012345678901234567890123456789012345678901234567890 (READ VERTICALLY)		015060	SR-GETVI69	
	015080 SR-GETVI71 015090 SR-GETVI72 1111112222222222333333344444444444555555556666666667777777778888888899 COLUHN NUHBERS 456789012345678901234567890123456789012345678901234567890123456789018890 (READ VERTICALLY)		015070	SR-GETVI 70	
	015090 SR-GETVI72 111111222222222233333334444444444455555556666666666		015080	SR-GETVI71	
	1111112222222223333333334444444444445555556666666666		012040	SR-GETVI72	

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 38 OF 82)

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CH+RECNAH3
CH+RECNAH3
CH+RPLCTNZ
CH+RSPTIH2
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SR-HEADE41
SP-HEADER2
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SR-HEADE 28
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SP-HEADE 36
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SR-HEADE38
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CM+LUGFLG3
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SR-HEADE43
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                                                      CONMIN / BAIL/ BLORNG, IBAIL
COMMIN / CONCENT CHENT(13,20), CONBUG(13), ICHNI, NIRC
COMMIN / DISPLY/ DISPLY(24), DISPN(12), RFCLBL(8), THPLBL(8)
COMMIN / DISPLY/ DISPN(24), DISPN(12), RFCLBL(8), THPLBL(8)
COMMIN / TLAG/ ENDREP, IDH; IFREPL, IDIGTL, IPRIV, IRNDOC, IT3FLG, 000331
LOGICAL ENDREF,
COMMIN / MIADNOC, ACOLBL(2,4), DAYLBL(2), DFSLBL(2), DGTLBL(2,2),
COMMIN / LIGANOC, ACOLBL(2,4), DAYLBL(2), DFSLBL(2), DGTLBL(2,2),
COMMIN / LOGFLG/ FIRSTL, SECHML, SPCL(70), SHRTEC, FTSILL
COMMIN / LOGFLG/ FIRSTL, SECHML, SPCL(70), SHRTEC, FTSILL
COMMIN / HISC/ DOAPR, POSTKL, RFLIF
COMMIN / HISC/ DOAPR, POSTKL, RFLIF
COMMIN / PEDESC/ ANGLET, GTRNG, REFL, DEF8, TGTHD, SKSFN
COMMIN / PEDESC/ ANGLET, GTRNG, REL, DEF8, TGTHD, SKSFN
COMMIN / PEDESC/ ANGLET, GTRNG, NELL, DEF8, TGTHD, SKSFN
COMMIN / RECNAM / WCODF, ACCODF, RSCOME, NFCHOE, RCODE, COMPON
COMMIN / RECNAM / WCODF, ACCODF, RSCOME, NFCHKL, SPTHKL, RASPY(3,2), DETTMALO,2), NDT, TRARPY(3,2), OOUNG
COMMIN / KUNDAT / PRAF, THM, HCASE, ICCPFG, IPPFG
COMMIN / SMURED / SMK2(3,3,2), SMK5(3,3,2), FRONT, NSHK2, NSHK5, OOUNG
COMMIN / SMURED / SMK2(3,3,2), SMK5(3,3,2), FRONT, NSHK2, NSHK5, OOUNG
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COMMON /SYMBOL/ BLANK, DECPNI, ALFRFT(27), ANUMBR(11), SEP(5),
1 DOLLAR
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          COMMON TIRE DURLOS, TIMNOM, TOF, TER, TIMPA, TIGTPS COMMON /TIME/ DURLOS, TIMNOM, TOF, TER, TIMPA, TIMRAL COMMON /UVALUE/ U(70), UPPI, UDI, UIDM, UIDIGI, USHK(2)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   DIMENSION ADUT(4,40), BOUT(4,40), COUT(4,40)
DIMENSION CH(10), RECODE(8)
DIMENSION UVALUE(70)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  ENCODE (40,420,ANUT(1,1+NXTLIN))
ENCODE (40,430,ANUT(1,2+NXTLIN))
FNCODF (40,440,ANUT(1,3+NXTLIN))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         EQUIVALENCE (U(1), UVALUE(1))
EQUIVALENCE (RECODE(1), WC ODF)
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DD 100 J=1,40
ARUT(I,J)=BLAHK
BOUT(I,J)=BLANK
COUT(I,J)=BLANK
               SUBPRIUTINE HEADER
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LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 39 Of 82)

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NUMBERS VERTICAL
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11122222 78901234
001111111 8901234561
00000000 12345678

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ENCODE (40,430,ANUT(1),4+NXT[1N)) ITGTTP ENCODE (40,450,AUT(1),5+NXT[1N)) ITGTTP ENCODE (40,450,AUT(1),5+NXT[1N)) ITGTTP ENCODE (40,470,AUT(1),5+NXT[1N)) DISSUMENCE ENCODE (40,480,AUT(1),8+NXT[1N]) TVFL NXT[1N=1] FNCODE (40,230,AUT(1),NXT[1N+R)) FFT ENCODE (40,430,AUT(1),NXT[1N+R)) FFT ENCODE (40,430,AUT(1),NXT[1N+R)) FFT ENCODE (40,420,AUT(1),10+NXT[1N))		110 ENCORF (40,570,ANUT(1,27+NYTLIN)) NYTLIN=NYTLIN+28 120 CONTINUE ENCORE (40,40,ANUT(1,1)XTLIN))SKSEN NXTLIN=NXTLIN+1 ENCORE (40,40,ANUT(1,NXTLIN)) NXTLIN+0 ENCORE (40,420,ANUT(1,NXTLIN)) ENCORE (40,420,ANUT(1,1)) ENCORE (40,420,ENUT(1,1)) ENCORE (40,430,ENUT(1,2)) ENCORE (40,430,ENUT(1,2)) ENCORE (40,430,ENUT(1,2)) ENCORE (40,430,ENUT(1,3)) ENCORE (40,430,ENUT(1,3)) ENTLIN+5 ENCORE (40,430,ENUT(1,3)) ENTLIN+5 ENCORE (40,430,ENUT(1,3)) ENTLIN+5 ENTLIN

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D (PAGE 40 OF 82)

COLUMN NUMBERS (READ VERTICALLY)

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SR-HEAD147
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                           FUCUE (40,600,80UT(1,HXTLIH) )(PEPLR(I,IPPEPL+IPPTY),I=1,3)
ENCODE (40,610,80UT(1,HXTLIH+1) )(DGTLB((I,IOIGTL),I=1,2)
ENCODE (40,620,80H)T(1,HXTLIH+2) )(DAYLB(IDH))
NXTLIH-HXTLIH+3
ITBARI-TRBAR
IF (PRSPT',GT,0,0) TPRAFI-PRSPTH+TOF
ENCODE (40,630,80H)T(1,HXTLIH) )TRRAFI
                                                                                                                                                                                                                                                                                                                                                                        (40,430,800T(1,MXTLIN+13))
(40,420,800T(1,MXTLIN+14))PDARPK
(40,720,800T(1,MXTLIN+14))PDARPK
(40,740,800T(1,MXTLIN+15))PFSLR(IDFU)
                                                                                                                           NXTLIN-UXTLIN-1

IF (IDIGTL.eq.2) GO TO 140

ENCORE (40,640,8RUJ(1, UXTLIN) IPRSDI

IXTLIN-UXTLIN-1

IF (FISILL) GO TO 150

IF (PRSPH.GT.0.0) GO TO 150

IF (PRSPH.GT.0.0) GO TO 150

IXTLIN-UXTLIN-UXTLIN-1

IXTLIN-UXTLIN-
                                                                                                                                                                                                                               ENGIDE (40,260,000T(1, HXTLIH) PFCPHSG NXTLIH=HXTLIH+1
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ENCODE (40,430,80HT(1,1XTLIH) )
NXTLIN-NXTLIN-1
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(40, 420, 800T(1, 1871 IN+17)
     ENCODE (40,500,804T(1,5) )PRSPTM
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NXTLIM=NXTLIN+1
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ENCODE (40,420,COUT(1,1))
FNCODE (40,430,COHT(1,2))
ENCODE (40,750,COUT(1,2))
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LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

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SP-HEAD153
SR-HEAD154
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SR-HEAD158
SP-HEAD159
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SR-HEAD161
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                                                                                                                                                                                                                                                                                                                          IF (IDVER(22).E0.1) EHCDDE (40.840.COUT(1.HXTLIH-7) )UVALUF(22)
IF (IDVER(22).E0.2) FHCDPE (40.850.COUT(1.HXTLIH-7) )UVALUF(22)
IF (10VER(22).E0.2) FHCDPE (40.850.COUT(1.HXTLIH-7) )
NXTLIH-1XTLIH-1XTLIH-1 )(ROLBL(1.IPNDGC+1).I=1.4)
EHCDDE (40.430.CHHT) NW------
                                                                                                                                                                                                                            ENCODE (40,420,CNUT(1,NXTLIN+3))
ENCODE (40,430,CNUT(1,NXTLIN+5))
ENCODE (40,430,CNUT(1,NXTLIN+5))
ENCODE (40,430,CNUT(1,NXTLIN+5))
IF (10VER(22),NE.0) GO TO 180
DECODE (10,820,UVALUE(22)) 11PRN
ENCODE (40,830,CNUT(1,NXTLIN+7)) (ACQUEL(1,ITRN),I=1,2)
                                                                                                      NXTLIN=7
GN TO 170
IF (IDVER(21).E0.1) ENCODE (40,790,COUT(1,5) )UVALUE(21)
IF (IOVEP(21).E9.2) ENCODE (40,800,COUT(1,5) )
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      DN 230 I=1,8
IF (IOVER(20+1).FQ.0) 60 TO 230
IF (IOVER(20+1).Eq.1) 60 TO 220
IF (IOVER(20+1).HE.2) STOP 'IN HEADER: EPPOR NUMBER
                                                                                                                                                                                                                                                                                                                                                                                                                                                            ENCODE (40,420,COUT(1,NXTLIN+13))
ENCODE (40,430,COUT(1,NXTLIN+14))
ENCODE (40,870,COUT(1,NXTLIN+15))
ENCODE (40,870,COUT(1,NXTLIN+15))
ENCODE (40,350,COUT(1,NXTLIN+15))
ENCODE (40,350,COUT(1,NXTLIN+17))
ENCODE (40,880,COUT(1,NXTLIN+17))
ENCODE (40,880,COUT(1,NXTLIN+17))
ENCODE (40,880,COUT(1,NXTLIN+17))
ENCODE (40,880,COUT(1,NXTLIN+17))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               IF (IDM.Eq.1.AMD.YWTHP.Fq.4H2200) ICMFLG=1
IF (IDM.Eq.2.AMD.YWTHP.HE.4H2200) ICMFLG=1
IF (ICMFLG.Eq.0) GG TG 210
ENGINE (100,280.CH(1) )PAYLBL(IDM),YWTHP
CALL CDMMNT (CM.10,.FALSE,,FALSE,)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   ENCODE (40,800,COUT(1,NXTLIN+18) )PPSTKL
ENCODE (40,430,COUT(1,MXTLIN+19) )
ENCODE (40,420,COUT(1,MXTLIN+20) )
                                              IF (IDVER(21).NF.0) GD TD 160
DECDPE (10,760.VVALUE(22) ) XUTHE, YWTHR
ENCODE (40,770.CMIT(1,5) ) XWTHE
ENCODE (40,780.CMIT(1,5) ) YWTHE
                                                                                                                                                                                                                                                                                                                                                                                                                   ENCODE (40,430,COUT(1,NXTLIN+10)
ENCODE (40,420,COUT(1,NXTLIN+11)
                                                                                                                                                                                  ENCODE (40,430,COUT(1,NXTLIH))
ENCODE (40,420,COUT(1,NXTLIH+1)
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- CONT'D LISTING D-1 FORTRAN LISTING OF COPE PROGRAM

CALL COMMIT (CM.10. FALSE., FALSF.)

COLUMN NUMBERS (PEAD VERTICALLY)

SP-HEAD201 SP-HEAD202 SR-HEAD203 SR-HEAD204 SR-HEAD205 SR-HEAD206

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SP-HEAD239
SR-HEA0240
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SP-HEAD223
SP-HEAD224
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SR-HEAD221
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SR-HEAD226
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              SP-HE A0208
SR-HE A0209
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SR-HEAD219
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SR-HEAD213
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SR-HEAD215
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|1.0,6|| REFL=,F4.2,8|| AMGLET=,F4.0,6|| OEFR=,F4.0,7|| GTMD=,F3.0,7|| S017570
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    2KSEN*#F3.0)
| FORNAT (1H1,5(10H* * * * * 1,2X,21HC A S E H U M 8 E P,15,2X,5(1017590
| TORNAT (1H1,5(10H* * * * * * 1,2X,21HC A S E H U M 8 E P,15,2X,5(1017590
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270 FORMAT (114, 2511 PROB DO KAPHEO TO LASE =, f6,3,9X,21H*)

280 FORMAT (114, 10HCHOICE OF , A10,5311 FOR PESPONSE TIME OATA IS INCONSOI

11STENT WITH TIME OF , A4,18H FOR WEATHER DATA }

200 FORMAT (114,2311 TARGET HEADING=, f4,0,9H DEGREES, 10X,1H*)

310 FORMAT (114,2311 TARGET'S RELECTIVITY=, f4,2,11X,1H*)

320 FORMAT (114,21H DELECTION BIAS=, f4,0,3H KM,5X,1H*)

330 FORMAT (114,20H) SEEKER SENSITIVITY=, f4,0,12H (10ULES/H*2,2X,1H*)

350 FORMAT (114,20H) SEEKER SENSITIVITY=, f4,0,12H (10ULES/H*2,2X,1H*)

360 FORMAT (124,26H) PROPE SINCE KILLS HISSIGN=, f4,2,8X,1H*)

370 FORMAT (124,26H) PROPE SINCE KILLS HISSIGN=, f4,2,8X,1H*)

360 FORMAT (124,6K)

390 FORMAT (15H RECORD HANDE): ,A10,22H USED TO QVERPIDE FOR ,A6)

390 FORMAT (16H PEDATA FOR FOR FTELLY)
                                                                                                                                                                             00 240 J=1,36
WRITE (6,900) (AMUT(1,J),I=1,4), (BOUT(I,J),I=1,4),(COUT(I,J),I=1,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          (114*,16X,6UTARGET,16X,1U*)
(114*,6M TYPE ,12,30X,1U*)
(114*,20H HUMBP DF VEHICLES=,12,16X,1U*)
(114*,32H HTAN DISTANCE BITHERN VEHICLES=,F4.0,3HM *)
(111*,17H TARGET VELOCITY=,F2.0,6H M/SEC,13X,1U*)
(111*,13X,11HTIMG INFO,14X,1U*)
      LOH* * * * * * ),/)
FORMAT (1H ,1X,23HN/HBEP OF RFPLICATIONS=,15,/)
FORMAT (8(5H*****))
                                                                                                                                                                                                                                         WRITE (6,910)
If (1cMT/NE.0) WPITE (6,920)
PO 250 J=1,1CNNT
WPITE (6,930) (CMFMT(1,J),1=1,13)
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LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

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SR-HEAD292
SR-HEAD293
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SR-HEA0265
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SR-HEAD267
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SP-HEA0279
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SR-HEA0284
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SP-HEA0271
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SR-HEA0263
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             AT (1H*, 19H ROUND RELIABILITY= F4.22.15%, 1H*)

AT (1H*, 2LH TIME BETWEFN ENUMDS=, F4.0, 4H SEC, 9%, 1H*)

AT (1H*, 2LH TIME OF FILGHT= F5.1, 4H SEC, 13%, 1H*)

AT (1H*, 2LH TIME OF FILGHT= F5.1, 4H SEC, 13%, 1H*)

AT (1H*, 6H PUNC=, F5.0, 1H*)

AT (1H*, 6H PUNC=, F5.0, 1H*)

AT (1H*, 4%, 29H DELTA T3 ASSUMFD T0 BE ZFRD, 10%, 1H*)

AT (1H*, 4%, 29H DETECT, COMMO, AMP PENC THES, 5%, 1H*)

AT (1H*, 11*, 29H PARAMITERIZEO RESPONSF TIME=, F4.0, 6H SEC *)
                                                                                                                                                                                                                                                                                                                                                                  (IN#,3411 PROB SUPPRESSED BY INDIRECT FIRE=,F3.2,2H *)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 $$ ), 8X, 15HC O N H F N T S, 9X, 6 (8H S$
                                                                                                                                                                                                 (IH*,1X*A10,27X,1H*)
(IH*,23H HOMINAL RESPONSE TIME=,F4.0,4H SEC,7X,1H*)
(IH*,30H PENB SUCCESSFUL DIGITAL TRAH=,F5.3,5X,1H*)
(IH*,28H PENB SUCCESSFUL VOICE TRAH=,F5.3,5X,1H*)
(IH*,14X,10HDFSIGHATOR,14X,1H*)
(IH*,6H TYPE ,1Z,30X,1H*)
(IH*,26H TYPE ,1Z,30X,1H*)
(IH*,16H PARL—OUT RANGF=,F5.0,2H M,5X,1H*)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  (1H*,1X,3A10,A7,1H*)
(1H*,14X,10HN0SCUPANTS,14X,1H*)
(1H*,24H VOLUNF OF SNOKF FIPFO: ,14,3H + ,14,3X,1H*)
(1H*,25H PROB PUST KILLS MISSION=,F4,2,9X,1H*)
                                                                                                                                                                                                                                                                                                                                                                                                (1H*,16%,7HWEATHER,15%,1H*)
   (IH*,33H NUMBER OF POINIDS PER ENGAGEMENT=,12,3X,1H*)
                                                                                                                                                                                                                                                                                                                                                                                                                                                    (1H*,10H MONTH OF ,A3,25X,1H*)
(1H*,14H THE DF DAY: >A4,20X,1H*)
(1H*,27H OTHERDE WITH WEATHER REC ,A10,2H *)
(1H*,32H USING "TEMPORARY" WEATHER DATA ,6X,1H*)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 (1114,1X,2A10,17X,1H*)
(1114,27H GVEPRIDF WITH TERFAIN PEC ,AIO,2H *)
(1114,31H USING "TFMPORAPY" TERPAIN DATA,7X,1H*)
                                                                                                                                                                                                                                                                                                                                    (144,1X,3A10,7X,1H*)
(144,8X,21HDESIGHATOF SUPPRESSEO,9X,1H*)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 (1814, 11X, 158TEPPAIN AND 10S, 12X, 114)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      (1H ,2X,4A10,3X,4A10,3X,4A10)
                                                                                                                                                                                    (1H*,1X,2A10,17X,1H*)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       120 FORMAT (IN , 6(RHS$
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       FORMAT (1H +13A10)
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LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

COLUMN NUMBERS (PEAO VERTICALLY)

(PAGE 44 OF 82)

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CM+RSPTIM2
CM+RSPTIM3
CM+RSPTIM4
CM+PSPTIM5
                                                                                                                                                       CM+KTEST 2
CM+RANOOM2
CM+RANOOM3
                                                                                                                                                                                                                                                                                             CM+RANGE 2
CM+RANGE 3
CM+PPLCTN2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             SR-HITCH14
SR-HITCH15
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    SR-HITCH16
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    P-H11CH18
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     SR-HITCH19
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   SR-HITCH20
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P-HITCH23
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   R-HITCH24
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    SP-HITCH25
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   SR-HITCH26
SP-HITCH27
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  R-HITCH28
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       R-HITCH29
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    SR-HITCH31
SR-HITCH32
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 CM+TARGET2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   CM+TIME 2
SR-HITCH12
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  SR-HITCH13
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     TCH17
SP-HITCHK2
SR-HITCHK3
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     TCH2]
                                                                                                                                                                                                                                                                  CM+P.ANOOM4
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     P-HIT
                                                                   CM+HI1
                                                                                                    CM+HIT
CM+HIT
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     SP-HI
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                                                                                                                                                                                                                                                                                                                                                                                                                                                           000810
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                                                                                                                                                                    COMMON /KIEST/ KIEST(20,6)
COMMON /KIEST/ KIEST(20,6)
COMMON FRI, IRJ, IRJ, IRJ, IRJ, IRS, IRS, IRJ, IPS, IRJ, 100640
I FRIJ, IRLJ, IRLJ, IRLJ, IRLJ, IRLS, IRLJ, IRLS, IRLS, IRLS, IRLJ, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, IRLS, 
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                                                                                                                                                                                                                                                                                                                                                                COMMON 'PEPCTN' KREP, NREP, KEF, HBF, HVEHKL
COMMON 'RSPTIH' RATETH(3), XHVADF(2), OUH1, BCSPTM(2,2), XMTIH(2,000790
COMMON 'RSPTIH' RATETH(3), XHVADF(2), DETTAA(10,2), HOF, TRAPRY(3,2), 000800
PRSPTH, FRDAR, PRSDT, PRSVT, ALPHA(2,7), RETA(2,7), DETTIH, 000810
BISSTP, RUHC, PCPMSG, PROMY
COMMON 'TARGET' TVEL, NVEHCL, OISBVH, ITGTTP, IHUTS, ITGTPS
COMMON 'TIME' OURLOS, TIMH'W, TOF, TBP, TIMEA, TIMEA1
                                                                                                                                  000430
                                              COMMON ZUITZ INDEX16,55.2), PETRL(60,10,7), DLTI(6), PKTBL(10,2), PRIBL(10,2), PRIBL(10,2), IRNGTT, RNGTTF(20), TTF(3,20,2), URNGPS, PNGPSI(10), PSITRL(10,2,3)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             IF (PHGHUW.LT.RHGTTF(IK), QR.RHGTTF(IK+1), LE.PHGNOW) GO TO 100
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   110 TFRACL=(RNGHDW-RHGTTF(IRM))/(RNGTF(IRM+1)-RNGTTF(IRM))
PH=TTF(10SGTP,IRM,ITGTPS)+TFRAC1*(TTF(IDSGTP,IRM+1,ITGTPS)
1 -TTF(IDSGTP,IRM,ITGTPS))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              GD TO 110
CONTINUE
STOP * IN HITCHK: FAILEO TO BRACKET PANGE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          RN20=UPAH31(1R20)
KTEST(18,KRF)=KTFST(18,KRF)+1
IF (PN20.LE.PH) GO TO 120
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   IA8RT=18
CALL ABRTTL (IABRT)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                DO 100 IK=1, HRNGTI
          SUBPRINTINE HITCHY
                                                                                                                                                                                                                                                                                                                                            REAL NXORNG
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 120 RETURN
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LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 45 OF 82)

1234	00000000011111111112222222333333333334444444555555556666666666	7777778 34567890	888888889 1234567890	COLUMN NUMBEPS (READ VERTICALLY)
ر	SUBROUTINE INITLZ	018490	SR-INITL ZZ	
د		000110	CM+ABORT 2	
	CONMON JACKHAR/ CHAR(10,120), NRFC COMMON JOVALUE/ D(70), DPPT, ODT, DIDN, DIDIGT, DSMK(2)	000150	CM+ACHAR 2 CM+OVALUE2	
	COMMON /FLAG/ EMDPEP, IDM, IPPFPL, IDTGTL, IPPTY, IRNOGC, IT3FLG,	000300	CM+FLAG 2	
	I ENDELG FINDER	000320	CM+FLAG 5	
		000450	CM+ICDDE 2	
	COMMON /INDEXI/ INDXII(2001)	000470	CM+1NDEX12	
	COMMON AND HEALT OF THE MANAGE LOCK OF THE STATES OF THE S	001040	CM+UVALUE2	
	DIMENSION IRAY(6)	018590	SR-INITL12	
,	DIMENSION IOPTUM(70)	018600	SP-INITL13	
ر	Supply the supply of the suppl	018610	25-INI 11.14	
U	באוניים	018630	SP-INITL16	
	FAUIVALENCE (ICOPF, COPF)	018640	SR-INITL17	
S		018650	SR-INITL18	
		018670	SE-INI 1619	
	CALL SYSTEMC (104, IRAY)	018680	SR-INITL 21	
ပ	* * * * * * * * * * * * * * * * * * *	018690	SR-INITL 22	
c	CALL UPERMS (LIPINDALPACOULPI)	018710	SE-INI 125	
ر	I C OD E = 8HOP T NNUMS	018720	SR-INITLES	
	CALL READMS (11, INPTHM, 70, ICODE)	018730	SR-INITL26	
ပ		018740	SR-INITL 27	
	2(1 100 1=12) H. C. J=CHAR(1)1)	018760	SP-INITLE	
		018770	SR-INITL 30	
007	CUNITRE	01810	SE-INITEST CR-1N1TEST	
,	CALL PFAULT	018800	SR-INITL33	
	CALL USET	018810	SR-INITE 34	
ပ		018820	SR-INITL35	
	HSANLITI ENDFLG="FALSE.	018840	SP-INITE 37	
ပ		018850	SP-INITE 38	
	KE LUKII END	018860	SR-INI 11.40	

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

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CM+PEDESC2
CM+PDINT 2
CM+PANODC2
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CM+PSPTIM4
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        CM+PSPIM5
CM+RUNDAT2
CM+SMUKE02
CM+SMUKE03
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         CM+LDGFLG2
CM+LDGFLG3
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CM+SYMBDL3
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CM+TIME 2
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CM+IN0EX12
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                                                                                                                                                                                                                                  CM+DESPNG2
                                                                                                                                                                                                                                                                                        CM+DISPLY2
                                                                                                                                                                                                                                                                                                                                                                                                                               CM+OVALUF2
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COMMON / ZENGLOS/ HPP, HPP, HPHGCL, CPHGD(11,2), SFGLOS(11,11), O00740

COMMON / ZENGLOS/ HPP, HPP, HPHGCL, CPHGD(11,2), SFGLOS(11,11), O00770

COMMON / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENGRAIN / ZENG
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                                                                                                                             COMMON / GAIL/ BLORNS, IBAIL
COMMON / CORENT/ CNEWICI3,20), CORBUF(13), ICANT, NTRC
COMMON / OESRNG/ DESPNG/3,2)
CONNON / DISPLY DISPL(24), FISPMC12), RECLBL(8), THPLBL(8)
COMMON / DOOF/ DEDOKL(10,3), NOFSP, NDOKIL, DOKILD
LGGLAL OWILD
COMMON / DVALUE/ D(70), DPRI, DDI, DIDN, DIDIGI, OSHK(2)
COMMON / FLAG/ ENPEFP, IDN, TPFEPL, IDIGIL, IPPIY, IRNDOC, ITSFLG,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      1 ENDELG
LOGICAL ENDELG, ENDREP
COMMON /FLITIM/ TOFAFY(16)
COMMON /HIT/ INDEX(6,5,2), PETBL(60,10,7), DLTT(6), PKTRL(10,2),
COMMON /HIT/ INDEX(6,5,2), PETBL(60,10,7), PKTRL(10), PSTTBL(10,2),
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           COMMON TARGET/ TVEL, NVENCL, OISRVH, ITGTPP, IMUTS, ITGTPS COMMON TIME/ DUFLOS, ITMEND, TOF, TRE, TIMEA, TIMEAL COMMON TIMEAL COMMON TWALUE/ UC70, UPRI, UDI, UIDIG, USRK(2) COMMON TWATHE/ PECLGG, PECLLS(2), PEGCEL(11,2), W16,11,2), TOIS(11), CLUUD(6), HCC, HVL, PASQL(6), WNDSPD(3,3), HUMID(2), EXTERNAL HOREC
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    COMMONI /SYMBOL/ BLANK, PECPNI, ALFRET(27), ANNIMBR(11), SEP(5),
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         COMMON IRECNAMI WONDE, ACCODE, PSCODE, DECODE, ROCODE, PECODE,
                                                                                           COMMON JABORT/ HARDRT(20,6), HSABLM
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  COMMON /ICODE/ ICODE
SURRDUTINE INPUT
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              REAL HXDENG
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1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890 (PEAO VEPTICALLY)

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 47 OF 82)

1234	000000000111111111122222222223333333334444444444	7777777 234567896	388888888891 1234567890	COLUMN NUMBEPS (PEAO VERTICALLY)
	DIMENSION A(80), B(8,10), IT(10) OINENSION NCB(75), CH(10) OINENSION NCB(75), CH(10)	001150	OM+L 5	
L	CALIFICATION OVACUT (100) TVARUT (100)	001180		
	EGGLVALENCE (LCDP) JOHN) (P(1), POVALUE(1))	.001200	0H+L 0H+L 10	
ر	OIMENSIUM WDATA(193), ACQDAT(161), RSPDAT(49), DFSDAT(31)	001230	0 H+M0 3	
L	TO THE WORK	001250		
		001260 001270	0M+M 0M+M	
	EQUIVALENCE (PSPDAT(1),BATRIM(1)) EQUIVALENCE (DESDAT(1),PEDAKL(1))	001280	DM+M DM+M	
	_		0N+M 12	
ر	EQUIVALENCE (AINVRA(1), PLTT(1))	001330	DM+M 13	
,	IEAY(1)=0		SE-INPUT38	
	IRAY(5)=LOCE(NOREC)		SR-INPUT39	
U			SR-INPUT41	
	DO 110 I=1,13		SK-INPUT42	
	CUMRUT(1)=BLATK Off 100 J=1,20	019300	SR-INPUT43	
100			SR-INPUT45	
110	CUNTINUE ON 120 1=1,70	019330	SR-INPUT46	
120			SR-INPUT48	
ں	0 = L NH 3 L	019360	SR-INPUT49	
	NLPTC=0		SR-INPUT51	
	ココストリン・コン・コン・コン・コン・コン・コン・コン・コン・コン・コン・コン・コン・コン		SR-INPUTS	
ن	NCAVE=NCAVE+1	019400	SR-INPULSE SP-INPULSE	
	WRITE (8,770) NCASE		SR-INPUT55	
ا د د	#PEAD_a_1 IMT.Of.THRITE HINTER CONTRACTOR ON PORT AND AND AND AND AND AND AND AND AND AND	019430	SR-INPUT56	
	FARE-A-LINE OF THE OF CHILL TOUGHT FIRM TOUGHT	019450	SR-INPUT58	
130	RFAD (5,870) (A(I),I=1,80) IF (FDF(5),FD.0.0) GO TO 340	019460	SR-INPUT59	
		019480	SR-INPUT61	
	IF (MLRIC.EG.O) SIGP 'IN INPUT: FOF FACOUNTEPED *	019490	SR-INPUT62	
	ENCUDE (IND) 8909CH(I)) CALL CHMMHT (CH:10.FAISEFAISE.)	019500	SK-INPULDS SR-INPUT64	
	60 TO 490	019520	SR-INPUT65	
ر 1 4 0	00-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-	019530	SR-INPUT66	
r J		019550	SP-INFUI68	
	IF (A(1).ME.1H\$) GT TT 150	019560	SR-INPUT69	
	CO TO 130	019580	SR-INPUT71	
U		019590	SP-INPUT72	
12345	00000000011111111112222233333344444445555555556666666677777778888888999012345678901234567890	23456789C	1234567890	COLUMN NUMBERS (READ VERTICALLY)

(PAGE 48 OF 82)

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SR-INPUIO6
SR-INPUIO7
SR-INPUIO8
SP-INPUIO9
SR-INPUIIO
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SP-INPUILZ
SP-INPUILZ
SR-INPUIL4
SR-INPUIL5
SR-INPUIL5
SR-INPUIL7
SR-INPUIL7
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SP-INPUIZI
SR-INPUIZI
SR-INPUIZI
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SP-INPUIZE
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SR-INPUT86
SR-INPUT87
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SE-INPULZO
                                          SR-INPUT77
SR-INPUT78
SR-INPUT79
SR-INPUT80
                                                                                                                                                                                                                                         SR-INPUT99
SR-INPU100
SR-INPU101
                  SR-INPUT74
SR-INPUT75
SR-INPUT76
                                                                                     SP-INPUT82
SP-INPUT83
SR-INPUT84
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SR-INPUT91
SR-INPUT92
SR-INPUT93
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SR-INPUT95
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SR-INPUT97
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SR-INPU103
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SP-INPU105
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                                                                              SR-INPUT81
019990
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02 00 70
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                                                                                                                                                                                                                         FNCGOE (100, 000, CN(1) )
CAL COMMIT (CM, 10, FALSE,, FALSE,)
190 IF (160, E0.2, AMO, IT(2), E0.2) GD TD 130
CALL USET
                                                                                                                                                                                                                                                                                                                                                                   210 WRITE (6,790) (A(I), I=1,80), ITI
STOP ' IN IMPUT: FRROF NUMBER 1
                                                                                                                                                                                                                                                                                                                                                                                             220 IF (IT(2).EQ.1) IPPFG=IT(3)-1
IF (IT(2).EQ.2) ICCPFG=IT(3)-1
GO TO 480
                                                                                                                                                                                                                                                                                                                                                                                                                                 SHRTEC=.TRUE.
If (IT(3).E0.2) SHRTEC=.FALSE.
GO TO 480
                                                                                                                                                                                                                 IF (NLRTC.NE.1) GO TO 200
                                                                                                                                                                                                                                                            (IGU. EQ. 2) GO TO 130
                                                                                                                                                                                                                                                                                                                                                                                                                                                                  240 IT2=IT(2)
UVALUE(IT2)=8(1,3)
                                                                                                                                                                                                                                                                                              CASE ITI OF "KEYWORP"
                                                                                                                                                                                     ENOFLG=.TRUE.
GU TO 490
                                                                                                                                                                                                                                                                              200 CONTINUE
                                                                                                                                                                                                                                                                                                                                                                                                                                  230
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LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D (PAGE 49 OF 82)

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00000000001111111111222222222333333334444444444	JLUMN NUMBERS	EAD VERTICALLY
000000000011111111112222222223333333334444444444	ပ	_
	00000000111111112222222222223333333334444444445555556666666666	123456789012345678º012345678º01234567890123456789012345678901234567890123456789012345678901234567890

250 112=11(2)	020160	CP-TNPIII 29	
	020170	SP-INPUI30	
CALL CREAO (IT2) GD TD 480	020180 020190	SP-INPUI31 SP-INPUI32	
260 IT2=IT(2)	020200 020210 020220	SR-INPUI 33 SR-INPUI 34 SR-INPUI 35	
IF (NCGO(ITZ), FO.0) U(ITZ) = D(ITZ) Gn Tn 480	020230	SR-INPU136 SR-INPU137	
270 HVAI HF (11)=11(2)	020250	SP-INPU138 SR-INPU139	
	020270	SR-INPU140	
280 UVALUE(III)=II(2)	020200	SP-INPU142	
	020310	SP-INPUI44	
COURT TO 480	020330	SR-INPU146	
300 IT2=IT(2)	020350	SR-INPUI48	
IT3=IT(3) IOVER(IT1)=O	020350	SP-INPUL49	
ENCODE (10,840,UVALUE(21))PISPM(IT2),PISPT(IT3),ITI GD TD 480	020380	SP-INPU151 SP-INPU152	
310 ENCODE (10,850,WVALUE(1T1))8FGLBL (IT1-20),IT(2),IT1	020400	SE-INPULSS SE-INPULS4	
	020420	SR-INPU155 SE-INPU156	
	020440	SP-INPUIST	
320 UIDN=IT(4) ITVER(III)=0	020490	SP-INPUIS9	
1r (IT(2), E0,11) 60 TH 330	020470	SP-INPU160	
EMCQDE (10,850,0VALOE(ITI))PECLBE(III-20),11(2),111 UPRT=0.0	050480	SP-INPU162	
U101GT=1T(3)	020500	SP-INPU163	
TSILL="FALSE" TE (IT(2), EO.1) FT(1) F. TP(1)	020510	SP-INPU164 SP-INPU165	
GN TO 480	020530	SPINPU166	
330 DECODE (10,910,D(1,3))UPRT	020540	SR-INPU167	
5	020560	SP-INPUL69	
FTSILL=.FALSE.	020570	SR-INPU170	
	02020	SP-INPU172	
340 IF (IT(2), E0.1) GU TU 350	020600	SP-INPU173	
UVALUE(31)=1.0 DECOOF (10,910,8(1,2))PUMC	020019	SP-INPUL75	
	050630	SP-INPU176	
350 UVALUE(31)=DVALUE(31) GN TN 480	020640	SR-INPU177 SR-INPU178	
	050660	SP-INPUL79	
340 TF (IT(2), NE.1) GO TO 370	020670	SP-INPU180	

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 50 OF 82)

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SR-INPUZIA
SR-INPUZIA
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SR-INPU222
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SR-INPU231
SP-INPU232
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SR-INPU227
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SR-INPUZO8
SR-INPUZO9
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SP-INPU229
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SP-INPU206
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                    SR-INPUI85
SR-INPUI85
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SR-INPUI88
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SR-INPU202
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SP-INPU204
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             020700
                                                                                           020780
020790
                                                                                                                                                                                                                                                                                                                                                                                                                                            FILL IN VALUES TO BF PASSEO TO REST OF PROGRAM VIA COMMON.
                                                                                                                                   IF (IT(JK).Eq.1) USHK(JK-2)=DSHK(JK-2)
IF (IT(JK).NE.1) DECNDE (10,910,8(1,JK) )USHK(JK-2)
                                                                                                                                                                                                                                                                                                                                                                                                                            *
                                                                                                                                                                                                                                                                                                                                                                                                                         *
                                                                                                                                                                                                                                                                      IF (IT(2).Eq.1) GO TO 460
SPCL(IT1)=.TRUE.
DECOOF (10,010,8(1,2) )UVALUE(IT1)
                                                                                                                                                                                                     SPCL(ITI)=.TRUE.
DECODE (10,910,8(1,2) )UVALUE(ITI)
                                                                                             DECOOF (10, 910,8(1,3) )UVALUE(IT1)
GO TO 480
                                                                                                                                                                                                                                                                                                                                                                                                                                                                            DECODE (10,789,100PE) XWTHP
DO 500 I=1,12
IF (XWTHP.NE.OISFN(I)) GO TU 500
           60 TO 480
0ECODE (10,910,8(1,2) )!!VALUE(IT1)
                                                                                                                                                                                                                                                                                                                                                                                                                            *
                                                                                                                                                                                                                                                                                                                                                                                  END OF "READ-A-LINE-OF-INPUT" LOOP
                                             IF (IT(2).Eq.1) 6N TN 400
SPCL(IT1)=.TRUE.
IF (IT(3).NF.1) 6N TO 300
UVALUE(IT1)=DVALUE(IT1)
                                                                                                                                                                                          IF (IT(2), Eq.1) GO TO 430
                                                                                                                                                                                                                                                                                                                                                                                                                              *
UVALUE (IT1)=0VALUF (IT1)
                                                                                                                                                                                                                                                                                                                                              END OF "KEYWORD" CASES
                                                                                                                                                                                                                                                                                                                                                                                                                              *
                                                                                                                                                                                                                                                                                                                SPCL(ITI) = . FALSE.
CONTINUF
                                                                                                                      SPCL(IT1) = *FALSE.
DO 410 JK=3,4
                                                                                                                                                                                                                                 SPCL(ITI) = . FALSE.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                       490 CODE=UVALUE(21)
                                                                                                                                                                                                                                                                                                                                                                                                                              * * * * *
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      500 CHITINUE
510 CONTINUE
                                                                                                                                                                                                                                                                                                                                                                                                            60 TN 130
                                                                                                                                                                                                                                                         GO TN 480
                                                                                                                                                                                                                                                                                                          60 TO 470
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                                                                                                                                                                         Gn Tn 480
                             GO TO 480
                                                                                         60 TO 480
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LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D (PAGE 51 OF 82)

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SR-INPUZ69
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DG 580 I=1,2
DG 580 J=1,2
AL PHA(I,J)=(THEAH(I,J)/TSIGHA(I,J))**2
BETA(I,J)=TSIGMA(I,J)**2/THFAH(I,J)
                                                                                                                                                                                                                                                                                                                                                                                                       IF (UMC.LT.3.) IPREPL=1

TRBAR=TRARRY(IPREPL=IPRTY_IDIGIL)+INF

IF (PRSPIM-NE.0.0) TERAR=PRSPIM+IDF

IF (TSILL) GO IO 500

IF (PRSPIM-GI.0.0) GO IO 590
                                                                                                                                                                         IF (IDVER(22).Eq.2) GD TD 560
CALL READNS (11,ACQDAT,IACQFL,ICQDE)
IWTHPL=193

IF (INVER(21), EQ.2) GN TD 520

CALL READNS (11, WDATA, IWTHPL, ICNDF)

WCDOE=CGDE

DD 530 I=1,2

WSUM(I)=0.0
                                                                                                                                                                                                                                                                                                          IF (IOVER(23), Eq.2) GD TO 570
CALL READMS (11, REPDAT, IRSPRL, ICODE)
RSCODE=CODE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   IDFSRE 31
IF (IDVER(24), E9.2) GD TO 600
CALL READMS (11, DFSDAT, IDFSRL, ICOPE)
                                                                                                WCFSUM(J)=WCFSUM(J)+PRGCFL(I,J)
0D 540 K=1,NCC
540 WSUM(J)=WSUM(J)+W(K,I,J)
550 CONTINUE
                                                                                                                                                                                                                                IGTR=GTRNG+.5
TDF=TDFARY(IGTR)
IF (SPCL(45)) TOF=UVALUE(45)
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IF (UNC.EQ.1.) IPPTY*2
                                                                                                                                                                                                                     GTRNG=UVALUE(56)
                                                                 WCFSUM(I)=0.0
DD 550 I=1,NVL
DT 550 J=1,2
                                                                                                                                                       CODE = UVALUE (22)
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IRSPRL=49
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SP-INPU319
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                                                                                                                                                                         IRNDUC=UVALUE(11)-1.0
IF (IRNDUC.E0.0.0R.IQVFP(25).FQ.2) GN TO 670
IF (INVER(27).WE.1) GN TN 650
CODE=UVALUE(25)
                                                                                                                                                                                                                                               CALL REAGNS (11,PSTDAT,TTPSFL,ICODE)
PSCODE=CODE
CONTINUE
                                                                                                                                                                                                                                                                                                                                                                                                                                                        690 IPEPL=4260
CALL PEAPHS (11, PFDATA, TPEPL, ICODE)
PECODE=CODF
                                                                                                                                                                                                                                                                                           CALL READUS (11, PONATA, IROPL, ICONF)
ROCODE = CODE
                      IF (.NDT.SPCL(42)) GD TG 610
TVEL=UVALUE(42)
GD TG 620
610 IXXX-3.0-ABS(2.5-FLDAT(INNTH))
TVEL=VELTBL(IPN,IXXX)
620 CGNTINUE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    If (IOVER(27),E0.2) GN TN 710
CODE-EUVALUE(27)
ITPSRL=41
                                                                                                     IDSGTP=UVALUE(16)
IF (.MOT.SPCL(43)) GO TO 630
MXPRPG=UVALUF(43)
                                                                                                                                                                                                                               DECODE (10,830,11(72) )ITRRH
                                                                                                                                                                                                                                                                                                                                     60 TO
60 TO
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CONTINUE
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IF (IDVER(26).NE.1)
CORE=UVALUE(26)
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OFFB = UVALUE (58)
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SP-INPU377
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SR-INPU392
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SR-INPU388
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CALL READMS (11,AINVOA,INVOPI,ICONF)
AICONE-COOE
CONTINUE
                                                                              IF (UVALUF(13), EQ.1.) GN TO 730
                                                                                                                                                                                                                                                                                                                    IF (INVER(28).E9.2) GN IN 740
CODE=UVALUE(28)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         IF (IPPFG,EQ.1) CALL PPLUT
IF (ICCPFG.EQ.1) CALL CCPLOT
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       750
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           IF (SPCL(32)) GN TO 79
NSMK2=USMK(1)
NSMK5=USMK(2)
CALL PSMOKE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   NRF=UVALUE(53)
NVEHCL=UVALUE(54)
DISBVH=UVALUE(55)
PCRMSG=UVALUE(61)
PR.DDM=UVALUE(62)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              PRSVTELVALUE (48)
PRSVTELVALUE (49)
RRITE UVALUE (50)
TBR=UVALUE (51)
NREP=UVALUE (52)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          ITGTTP=UVALUE(14)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    IT3FLG=UVALUE(31)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     750 PSMKKL=UVALUE(32)
760 CONTINUE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          DOARPK=UVALUE(41)
BLORMG=UVALUE(44)
PDSTKL=UVALUE(47)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   CALL HEADER
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                                                                                                                                                                                                                                               720
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840 FORMAT (A3, A4, I3, 3)
850 FORMAT (A6, I2, 2, I2, 2)
850 FORMAT (A6, I2, 2, I2, 2)
860 FORMAT (80A1)
870 FORMAT (80A1)
870 FORMAT (111, 80A1)
870 FORMAT (1
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022850
022860
022870
022880
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                                                                                                                                                                                                                                                                                                                                                                                                      770 FORMAT (1H ,50(1H*), 1X,23HINPUT OPTIONS FOR CASE ,13,1X,50(1H*)) 022910
780 FORMAT (A3,7X)
790 FORMAT (1H ,23H ERROR IN INPUT. LINF: ,80A1,11H WITH ITI= ,15,1,13022930
1H IS IN ERROR )
800 FORMAT (A6,12,2,2127)
810 FORMAT (A6,12,2,2127)
810 FORMAT (1H ,18HYOUR INPUT LINE : ,1X,80A1)
812 FORMAT (1H ,58HSUPERSEDES ONE OF YOUR PREVIOUS INPUT LINES FOR THIO22970
815 CASE )
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       022990
023000
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                                                                                                                                                         CALL ECHO (8)
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LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 55 Of 82)

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CM+FLAG 3
CM+FLAG 4
CM+KTEST 2
CM+RANODC2
CM+RANODM2
                                                                                                                                                                                                                                                                                                                                                                CM+RANODM4
CM+RANGE 2
CH+RANGE 3
CM+RPLCTN2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          SP-L0SCH14
SR-L0SCH15
SR-L0SCH16
SP-L0SCH17
SR-L0SCH19
SR-L0SCH19
                                                                                                                                                                                                                                                                                                                                                                                                                                                                               CM+TARGET2
CM+TIME 2
SR-LOSCH12
                                                                                                                                                                                                                                                                                                                                         CM+RANODM3
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              SR-L 0SCH23
SR-L 0SCH24
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                                                                                                                                           COMMON /FLAG/ ENDRFP, IDN, IPREPL, IDIGTL, IPRIY, IRNDAC, IT3FLG,
                                                                                                                                                                                                                                                                                                                                                                                                      REAL HXORNG
COMMON / PRICTH/ KREP, HREP, KRF, HRF, NVEHKL
COMMON / TARGET/ TVEL, HVEHCL, DISRVH, ITGITP, IMUTS, ITGIPS
COMMON / TINE/ OUELOS, ITHHOW, TOF, TRR, TIMPA, TIMRAL
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               STOP * IN LOSCHK: EPROP WITH PAHOOM OCCUPRENCE OPTION *
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            PHGHINW=AMAX1(0.0,DTPHG-TVEL*TIMPA)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  KTEST(12,KRF)=KTEST(12,KRF)+1
IF (IRMDG,E0,1) GO TO 100
IF (IIMPA,LF,DUPLOS) GO TO 130
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                DO 110 I=1.NPLOSR
IF (PHGNOW.LE.PHGPLS(T)) GO TO
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      PRIV=1.-(1.-PRLOS) **XHV
RN18=URAH31(1P18)
IF (PH18.LE.PRIV) GG TG 130
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      IARRT=12
CALL ABRTTL (IABPT)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        IABRT=12
CALL ABRTTL (IARRT)
                                                                                       SURROUTINE LOSCIN
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  XNV* NVEHCL -NVEHKL
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          50 TO 130
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LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 56 OF 82)

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SR-MINTP36
SP-MINTR37
SR-MINTR38
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SR-MINTR19
SR-MINTR20
SR-MINTR21
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SR-MINTP23
                                                                                                                                                                      CM+RANGF 3
CM+RPLCTN2
CM+TAPGET2
CM+TAPE
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                                         SR-MINTRNZ
SR-MINTRN3
CM+HIT 2
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SR-MINIR13
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SR-MINTRI7
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                                                                                                                     CM+RANODM2
CM+PANODM3
                                                                                                                                               CM+RANOUM4
CM+PANGE 2
                                                                                                                                                                                                                                                                                                                                                                                                 SR-MINTR24
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                                                                                                         CM+KTEST
                                                                                   CM+HIT
                                                                                              CM+HIT
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0000690
0001000
001020
001020
023620
023640
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023820
023830
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023540
000410
000420
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COMMON /KTEST/ KTEST(20,6)
COMMON / PANNOM/ IR1, IP2, IP3, IR4, IP5, IR6, IP7, IP8, IR9, IR10,000640
COMMON / PANNOM/ IR13, IP14, IE15, IF16, IP17, IP18, IR19, IR2000650
I IP11, IR12, IR23, IP24, IR25, IR26, IP27, IP28
COMMON / RANGE/ DIPHG, MXORMG, VISLIM, PHGNOW
                                                              COMMON /HIT/ INDEX(6,5,2), PETBL(60,10,7), OLTI(6), PKTBL(10,2), I NPNGTT, RHGTTF(20), TTF(3,20,2), HEHGPS, PHGPST(10), PSTTBL(10, 2 3)
                                                                                                                                                                                                                                                                                                                                                                                                  DG 120 J=1,3
PSTVAL(J)=PSTTBL(IPN,J)+TFPAC*(PSTTBL(1PN+1,J)-PSTTBL(IPN,J))
120 CGNTINUE
                                                                                                                                                                                                                                                                                                   DO 100 IJ=1,NRNGPS
IF (RNGNOW.LI.RNGPST(IJ).OP.PNGPST(IJ+1).LF.PNGNOW) GO TO 100
                                                                                                                                                                                      COMMON /TARCET/ TVEL, NVERP, NPF, NVEHKL COMMON /TARCET/ TVEL, NVEHCL, DISRUM, ITGITP, IMUTS, ITGIPS COMMON /TIME/ OURLOS, TIMOM, TOF, IBP, IMRA IMRA
                                                                                                                                                                                                                                                                                                                                                                                     110 TFRAC=(RNGNON-RHGPST(IRH))/(RNGPST(IRN+1)-RNGPST(IRN))
                                                                                                                                                                                                                                                                                                                                                             STOP . IN MINTRH: FAILED TO BRACKIT RANGE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                IF (PSTVAL(1).LE.RM19) ITGTPS=1
IF (PSTVAL(2)+PSTVAL(1).LE.RM19) ITGTPS=2
                                                                                                                                                                                                                                                                       RNGNOW=AMAX1(0.0,D)DTRNG-TVEL*TIMRA)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    KTEST(16,KRF)=KTEST(16,KRF)+1
IF (ITGTPS.NE.O) CO TO 130
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        CALL ABRITL (IABRI)
                                                                                                                                                                                                                                                 DIMFNSION PSTVAL(3)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                        RN19=URAN31(IR19)
                                                  SUBPROUTINE MINTEN
                                                                                                                                                                                  PEAL MXORNG
                                                                                                                                                                                                                                                                                                                                           GO TO 110
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                IARRT=16
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                                                                                                                                                                                                                                                                                                                                                        100 CONTINUE
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LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 57 0F 82)

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023940 SP-NORFC 2	
023950 SR-NDREC 3	
000450 CM+ICO0E 2	
023970 SP-NOREC 5	
023980 SP-NOREC 6	
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024000 SP-NOREC 8	
024010 SR-NOREC 9	
024030 SR-NOREC11	
024040 SR-NOREC12	
024050 SR-NOREC13	
024080 SR-NOREC16	
024090 SR-NOREC17	
77778888888889	00000000011111111112222222333333334444444444
9 99400000000000	SUBRIGUTINE NIMEC CALL STRACE STAPP I IN NIMEC: ATTEMPTED TO READ NICH-EXISTENT RECORD + 024040 SR-NORECION SR-NORECION STAPPED TO READ NICH-EXISTENT RECORD + 024020 SR-NORECION SR-NORECION STAPPED SR-NORECION SR-NORECIO

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SP-DUTPU38
SR-DUTPU39
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SP-DUTPUT2
SP-DUTPUT3
CN+ABORT 2
CN+ABRLBL2
CM+DOOF 2
CM+DUOF 3
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SR-DUTPU15
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SR-OUTPU18
SP-OUTPU19
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CM+SCCSS 2
SR-DUTPU12
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                                                                                CM+FLAG 3
CM+FLAG 4
CM+KTEST 2
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                                                                                                                     CN+RPLCTN2
                                                                        CM+FLAG
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024530
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IF (PHDREC(J), HF,FLOAT(PKILL(J))) WPITE (6,300) J,PNDRFC(J),HKILL(024580
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                      CONNIGH /ABORI/ HARBRI(20,6), MSAB! H
COMMON /ABRLBL/ ICARRI(3,19)
COMMON /DODF/ DFONKL(10,3), NOFSP, MDOKIL, DOKILD
LOGICAL OMKILO
COMMON /FLAG/ EMDPFP, ION, IPREPL, IDIGIL, IPRIY, IRNDOC, IT3FL6,
L ENDFL6
                                                                                                                                                                                                                                                                                                                       ABPPCT(I,J)=-1.0
IF (HREP.NE.0) ABPPCT(I,J)=100.*FLOAT(NANORT(I,J))/FLOAT(HRFP)
CONTINUE
                                                                                                                                                                                                                                                                                                                                                                                                                                           DO 140 1=1,19
IF (HTEST(1,1),Co.0) PASPCT(1,1)*-1.0
IF (NTEST(1,1),Hf.p) PASPCT(1,1)=100.*(1.-FLUAT(WABDRT(1,1)))
1 /FLUAT(WTEST(1,1)))
140 CONTINUE
                                                                                               LOGICAL ENDELG, EHOREP
COMHON /KTEST/ KTEST(20,6)
COMHON /KTEST/ KTEST(20,6)
COMHON /RELTN KREFP, MRFP, KRE, INCFFG, IPPFG
COMHON /RUNDAT/ DAT, TIM, HCASE, ICCPFG, IPPFG
COMHON /SCCSS/ PHOPEC(6)
DIMENSION WRILL(6), MIT(6)
DIMENSION PREPCT(20,6), HTEST(20,6), PASPCT(20,6)
OIMENSION PREMCT(6)
                                                                                                                                                                                                                                                                                                                                                                                          00 150 J=1,6
NTEST(1,J) + NREP
00 130 1=2,19
NTEST(1,J) + NTEST(1-1,J) - NABORT(1-1,J)
CONTINUE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                IATEMG=NTEST(8,1)
ISHOT=NTEST(12,1)
        SUBBROUTINE DUTPUT
                                                                                                                                                                                                                                                            0f 100 I=1,20
NTEST(I,J)=D
                                                                                                                                                                                                                                                                                                                     DO 120 I=1,19
ON 120 J=1,6
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    00 160 J=1,6
                                                                                                                                                                                                                         00 110 J=1,6
                                                                                                                                                                                                                                    NKILL(J) = 0
OUT(J) = 0.0
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      ICCSN=NP.EP
                                                                                                                                                                                                                                                                                  CONTINUE
CONTINUE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 160 CHNTINUF
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               150 CONTINUE
                                                                                                                                                                                                                                                                                  100
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LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

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SR-OUTPU65
SR-OUTPU66
                                                                                                                                                                                                          SR-OUTPU68
SP-OUTPU69
SR-OUTPU70
                                                                                                            SR-DUTPU59
SR-DUTPU60
                                                                           SR-OUTPU56
                                                                                                SP-0UTPU58
                                                                                                                                                                                                                                                                        SR-OUTPU74
SR-OUTPU75
                                                                                       SR-OUTPU57
                                                                                                                               SR-OUTPU61
                                                                                                                                           SP-OUTPU62
                                                                                                                                                     SP-DUTPU63
                                                                                                                                                                                                                                                                                                                                                            R-OUTPU82
R-OUTPU83
                                                                                                                                                                 SP:-0UTPU64
                                                                                                                                                                                                :--0UTPU67
                                                                                                                                                                                                                                        R-DUTPU71
                                                                                                                                                                                                                                                                                                                                                                                                                  1 PU 8 7
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     SR-OUTPU95
SR-OUTPU96
                                                                                                                                                                                                                                                    SR-DUTPU72
                                                                                                                                                                                                                                                             SR-OUTPU73
                                                                                                                                                                                                                                                                                              SR-DUIPU76
                                                                                                                                                                                                                                                                                                        SP-0UTPU77
                                                                                                                                                                                                                                                                                                                   SR-0UIPU78
                                                                                                                                                                                                                                                                                                                               SP-DUTPU79
                                                                                                                                                                                                                                                                                                                                       SR-DUTPUBO
                                                                                                                                                                                                                                                                                                                                                                                  SR-OUTPUB4
SR-OUTPUB5
                                                                                                                                                                                                                                                                                                                                                  SR-OUIPUB1
                                                                                                                                                                                                                                                                                                                                                                                                       SP-00TPU86
                                                                                                                                                                                                                                                                                                                                                                                                                                                  P-0UTPU90
                                                                                                                                                                                                                                                                                                                                                                                                                                                                     SP-OUTPU92
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 PU93
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           PU97
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   SP-001P101
SP-001P102
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           -0UIPU94
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    SP--OUTPU98
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               SP-DUTPU99
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          SR-DUIP100
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         SP-OUTP106
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         R-0UTP103
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              P-00TP105
                                                                                                                                                                                                                                                                                                                                                                                                                  SR-OUT
                                                                                                                                                                                                                                                                                                                                                                                                                                       SR-DUT
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 -00T
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           SR-OUT
                                          024620
024630
024640
024650
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         025120
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             WRITE (6,340) Is(IOABRT(K,I),K=1,3),HABOPT(I,1),XOUT,NTEST(I,1),
                                                                         IF (INCSH.HE.O) PPBKO(J)=100.*FLDAT(HKILL(J))/FLDAT(IDCSN)
IF (IATENG.NF.O) PPBKAE(J)=100.*FLDAT(HKILL(J))/FLDAT(IATENG)
IF (ISHUT.NE.O) PPBKS(J)=100.*FLDAT(HKILL(J))/FLDAT(ISHNT)
                                                                                                                                        PRBSAE=-1.0
PRBAEG=-1.0
FF (IOCSN.NE.O) PRBSO=100.*!LOAT(ISHOT)/FLOAT(IOCSN)
IF (IATENG.NE.O) PRBSAE=100.*FLOAT(ISHOT)/FLOAT(IATENC)
IF (IOCSN.NE.O) PRBAEG=100.*FLOAT(IATENG)/FLOAT(IOCSN)
                                                                                                                                                                                                                                                                                                                                                                                                     PROCKC=-1.0

IF (RREP.NE.O) PROCKL=100.*FLCAT(HODK1L)/FLCAT(NPEP)

IF (HTEST(14,1).NF.O) PROCKC=100.*(1.-FLCAT(POCKIL)

/FLCAT(RTEST(14,1))
                                                                                                                                                                                                       00 180 J=1,6
PRHLOS(J)=PASPCT(11,J)*PASPCT(12,J)/100.
CONTINUE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  IF (I.Eq.7) WRITE (6,390) IATENG IF (I.Eq.11) WRITE (6,400) ISHNT COHTINUE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    X=A8PPCT(1,1)
XOUT=FPRCNT(X, TPUE.)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Y=PASPCT(I,1)
YOUT=FPECHT(Y, TPUF.)
                                                                                                                                                                                                                                                                                                                                                                                                                                                         WRITE (6,320)
WRITE (6,330) IDCSN
                               DO 170 J=1,6
PR 8KG(J)=-1,0
PR 8KAE(J)=-1,0
PR BK S(J)=-1,0
                                                                                                                                                                                                                                                    190 II=1,20
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         OR 210 I=1,11
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              WP.ITE (6,350)
                                                                                                                                                                                                                                                                                                                                                                                           PP.00KL =-1.0
                                                                                                                                PR850=-1.0
                                                                                                         CONTINUE
                                                                                                                                                                                                                                                                                                                                                                     200 CONTINUE
                                                                                                                                                                                                                                                             1. I MU=1
                                                                                                           170
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LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D (PAGE 60 OF 82)

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SR-0UTP144
SR-0UTP145
SR-0UTP146
SP-0UTP147
SR-0UTP149
SR-0UTP149
SR-0UTP150
                                                                                                                                                                                                                                                                                    SR-001P134
SR-001P135
SR-001P136
SR-001P137
SR-001P138
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       SR-0UTP154
SR-0UTP155
SP-0UTP156
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              SP-001P159
SP-001P160
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   SR-0UTP152
SP-0UTP153
                                                                                                                                                                                                                              SR-001P129
SR-001P130
SR-001P131
SR-001P132
                                                                                                                                                               SR-001P123
SR-001P124
SR-001P125
SR-001P126
SR-001P127
SR-001P127
                                                                                                                                                                                                                                                                                                                                                     SR-DUTP140
                                                                                                                                                                                                                                                                                                                                                                          SR-00TP142
SP-00TP143
SR-001P108
SR-001P109
SR-001P110
SP-001P111
                                                                                                                      SR-00TP119
SR-00TP120
                                                                                                                                           SR-0UTP121
SR-0UTP122
                                                                                                                                                                                                                                                                                                                                                                 SR-0UTP141
                                                       SR-0UTP113
SR-0UTP114
SR-0UTP115
                                                                                                                                                                                                                                                                          SP-00TP133
                                                                                        SR-0UTP116
SP-0UTP117
                                                                                                            SP-00TP118
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                       025190
025200
025210
025220
025230
                                                      WRITE (6,360) I, (IDABRT(K,1), K=1,3), (HARORT(I, J), OUT(J), J=1, NRF)
OD 230 J=1,NRF
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        XOUT=FPRCHT(PROOKL).TRUE.)
YOUT=FPRCHT(PROOKC,.TRUE.)
WRITE (6,460) NOOKIL,XOUT,NIEST(14,1),YOUT
                                                                                                               WRITE (6,370) (HTEST(I,J), MUT(J),J=1,NPF)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     STATFMENTS
                                                                                                                                                 WRITE (6,380) (HKILL(J), J=1, HRF)
                                                                                                                                                                                                                                                                                                                                                                                                              WEITE (6,450) (AUT(J), J=1, NEF)
                                                                                                                                                                                                                                                                                                                                               WPITE (6,430) (AUT(J), J=1, HRF)
                                                                                                                                                                                                                                                                                WRITE (6,420) (MIT (J), J=1, HPF)
                                                                                                                                                                                                                 WRITE (6,410) (00T(1), I=1, NRF)
                                                                                                                                                                                                                                                                                                                                                                                                                                    XUUT=FPECNI(PRBSG, FALSE.)
YOUT=FPECHT(PPBSAE, FALSE.)
ZUUT=FPECHT(PRBAED, FALSE.)
WRITE (6,440) XOUT, YOUT, ZOUT
                                                                                                                                                                                                                                                                                                                      X*PRBKS(J)
OUT(J)*FPRCNT(X,.FALSE.)
CONTINUE
                                                                                                                                                                                                                                                                                                                                                                                          OUT(J)=FPRCNT(X,.fALSE.)
                                                                                                                                                                                                                                                         OUT(J)=FPRCNT(X, FALSF.)
CONTINUE
                                                                                                                                                                                       DUT(J) = FPRCNT(X, FALSE.)
CONTINUE
                             X = ABRPCT(1, J)
DUT(J) = FPRCNT(X, TPUE.)
CONTINUE
                                                                                            DUT(J) = F PRCHT(X, TRUE.)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        * * FORMAT
                                                                                                                                                                                                                                                                                                                                                                        ON 280 J=1, NRF
           240 I=12,19
220 J=1, HRF
                                                                                                                                                                                                                                          00 260 J=1,NRF
                                                                                                                                                                                                                                                                                                          00 270 J=1,NRF
                                                                                                                                                                           J=1,NRF
                                                                                      X=PASPCT(I,J)
                                                                                                                                                                                                                                                     X=PRBKAE(3)
                                                                                                                                                                                                                                                                                                                                                                                    X=PP.HLOS (J)
                                                                                                                                                                                  X=PRBKU(J)
                                                                                                                                CONTINUE
                                                                                                            CONT INUE
                                                                                                                                                                            00 250
                                                                                                                                                                                                                                                                                                                                                                                                           280
                                                                                                                                                                                                                                                                                                                                           270
                                                                                                                                  240
                                                                                                                                                                                                                                                                            260
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                                                                                                             230
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LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D (PAGE 61 OF 82)

COLUMN NUMBERS (READ VERTICALLY)						
78888888889 001234567890	SR-OUTPIGI SR-OUTPIG2 SR-OUTPIG3	SR-OUTP164 SR-OUTP165 SR-OUTP166 SR-OUTP167	SR-001 P168 SR-001 P169 SR-001 P170 SR-001 P171	SR-00TP172 SR-00TP173 SR-00TP174 SR-00TP175	58-001P176 SR-001P177 SR-001P178 SR-001P179 SR-001P180	SR-001P181 SR-001P183 SR-001P184 SR-001P186 SR-001P186
00000000111111111122222222233333334444444444	290 FORMAT (56H SERIGUS PROBLEM ! KTFST AND NTEST ARRAYS DO NOT AGREE025700 1.94H II-1594H JJE-15) 300 FORMAT (11 ,24H IN OUTPUT, PROBLEH I J=,15,9H PNDREC=,F5.0,8H NK025720 11(L=,15)	310 FORMAT (IH)12HKTEST ARRAY: // (IH , 6110)) 320 FORMAT (IHI)14X,14HCAUSE OF ABORT) 330 FORMAT (50X,5H****)1X,10HOCCASIONS JH(,15,1H),6H *****) 340 FORMAT (III ,/,1H ,12,3X,3A10,17,1H(,A7,5X,25HMHMFR FESTED /* DASCAST	350 FORMAT (1H)/1 12,3X,3A10,6(T7,1H1,14X,1H2,14X,1H3,14X,1H4,1025790 350 FORMAT (1H)/1H) 12,3X,3A10,6(T7,1H1,14X,1H2,14X,1H4,1025790 360 FORMAT (1H)/1H) 12,3X,3A10,6(T7,1H1,4X),1	»A71) ****) NIS (»I5»7H) ***	400 FDRMAT (1H ,1,53%,6H***** ,7115HDTS (,15,7H) *****) 410 FDRMAT (1H ,1,8%,30HPRDB (KILL/DCSN)= ,10,5,7H) *****) 420 FDRMAT (8X,30HPRDB (KILL/ATMP FNG)= ,1X,6(AIO,5X)) 430 FDRMAT (8X,30HPRDB (KILL/SHOT)= ,1X,6(AIO,5X)) 440 FDRMAT (8X,16HPRDB (KILL/SHOT)= ,1X,6(AIO,5X) 440 FDRMAT (8X,16HPRDB (SHOT/DCSN)=,1X,AIO,8X,20HPDR (SHOT/ATM)	4.5 Alo, 8X, 50HPR. DICATIP ENG/NCSN)*, IX, AIO) 450 FORMAT (8X, 30HPR. DICATO) 460 FORMAT (11 // 111 / 51HDESTEIN SHRVIVABILITY: CASES IN WHICH 0ES1025930 251H(AA7) 221H(AA7) 615 ALO

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D (PAGE 62 Of 82)

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SR-PECHK 21

SR-PECHK 22

SR-PECHK 25

SR-PECHK 25

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SR-PECHK18
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SR-PECHK40
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              CM+RSPT1M5
CM+TARGET2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      SP.-PECHK14
SR-PECHK15
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              SP-PECHK36
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         SR-PECHK38
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            SP-PECHK43
                                                                                                                                                                                                                                                                                                                                                                   CM+RANDOM3
CM+RANDOM4
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  CM+RPLCIN2
CM+RSPTIM2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          SR-PECHK37
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      SR-PECHK 41
                                                                                                                                                                                                                                                                                                             CM+KTEST 2
CM+RANOOM2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    CM+TIME 2
CM+WEATHR2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      CM+WEATHR4
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           R-PECHK19
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           R-PECHK 20
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           CM+RSPI1M3
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                CM+WEATHR3
                                                                                                                                                                                                                                                                                                                                                                                                                                  CM+RANGE
                                                                                                                                                                       CM+FLAG
CM+FLAG
CM+HIT
                                                                                                                                              CM+FLAG
                                                                                                                                                                                                                                                             CM+HIT
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026130
                                                                                                                                                                                                                                                                                                                                                                                                                                                                            COMMON (PRPCTN) KREP, HREP, KRE, HRF, NVEHKL
COMMON (PRPCTN) FATRIH(3), XHVADE(2), OUM1, BCSPIM(2,2), XHTIIM(2,000770
COMMON (PRSPIIH) FATRIH(3), XHVADE(2), OUM1, BCSPIM(2,2), XHTIIM(2,000790
1 2), THEAN(2,2), TSIGMA(2,2), DETTHA(10,2), BTAT(2,2), DETTIM, 000810
2 PRSPIH, PROAR, PRSVI, ALPHA(2,2), BTATIH, 000810
COMMON (TARGET) TVEL, NVEHCL, DISNUH, ITGITP, INUTS, ITGIPS 001000
COMMON (TIME OHEUS) INUMN, TGF, TRP, ITHPA, ITHPA, 0001000
COMMON (AMATHAR PRCLCS, PRCELS), PROCCE(11,2), W(6,11,2), 001000
1 VISILI), CLOUD(6), MCS, NVL, PASQL(6), WNDSPO(3,3), HUMID(2), 001080
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              026180
026190
026200
026210
026220
026230
026240
026250
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        026270
026280
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     026300
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    026310
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   026350
026360
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         026370 026380
                                                                                                                                                                                                                                                                                                                                                                                                                            000680
000690
000770
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               026390
                                                                                                                                                                                                                             000410
000420
000430
                                                                                                                                                                                                                                                                                                                   COMMON /KTEST/ KTEST(20,6)
COMMON /KANDOM/ IR1, IR2, 1P3, IR4, IR5, IP6, IR7, IR8, IP9, IR10,000640
COMMON /RANDOM/ IR12, IR13, IR14, IR15, IF16, IR17, IR18, IR19, IR20, IR21000650
I PRIJ, IR12, IR13, IR25, IR26, IR27, IR28
COMMON /RANGE/ DIRMS, MXDPHG, VISLIM, PHGNOW
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              026290
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          026330
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         026340
                                                                                     SUBROUTINE PECHK 025980 COMMON /FLAG/ ENDREP, IDN, IPREPL, IDIGIL, IPPTY, IPNDOC, ITSFLG, 000300
                                                                                                                                                                          000310
                                                                                                                                                                                                         000320
                                                                                                                                              1 ENOFIGE CONTROL AND AFRICE, ADAGIL, IPPIT, IPPORC, ITSFLG, LOGICAL ENDFLG, ENDREP COMMON (HIT/ INDFX(6,52), FETBL(60,10,7), DLTI(6), PKTBL(10,2), CHMON (HIT/ INDFX(6,52), TF(3,20,2), HRHGPS, PHGPST(10), PSTTRL(10,2), 3)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       1F (IPREPL.EQ.1.AMD.1T3FLG.FQ.1) T3=TR8AR+DETTIM-RUMC/IVEL
DELTAT=T1+T2+T3
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         FIND 1RHG1 AND IRNG2 WHICH BRACKET RHGK.

IF RHGK<1, IRNG1=IRHG2=1; IF PNGK>7, IFHG1=IRNG2=7.

OTHERWISE, IRNG1 <= PNGK < IRHG2.

IPHG1 AND IRNG2 WILL BE USED IN INTERPOLATING IN PETBL.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        T1=FLDAT(KRF-1)*TBR-FLDAT(NVEHCL-1)*DISBVH/TVE1
T2=T1NRA1-OETTIM-TPBAR
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    IF (RNGK.LT.1.0.0R.1RH51.F9.7) IRHG2=IRHG1
IF=AMAX1(RNGK-FLDAT(IRHG1).0.0)
IF (FF.62.0.9) GN TO 100
IF=FF.(FLDAT(IRHG2)-FLDAT(IPHG1))
IF (INUTS.HE.2) GO TO 110
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      IF (DELTAT.LE.0.0) OFLTAT=0.0
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            1F (OFLTAT.LE.O.O) IMUTS=2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        II=IMDEX(ICC,IDELT;IMUTS)
IVLA=MIMO(IVL,IO)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          IRNG1=MIM1 (RNGK, 7.0)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    IRMG1=MAXO(1, IRMG1)
IRMG2=1RMG1+1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           RNGK = RNGNUW / 1000.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                 REAL HXPRHG
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     I MUTS=1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              100
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              000000
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LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D (PAGE 63 OF 82)

PEZ=PETBL(II)IVLAJIRHGI)	026400	SR-PECHK 44	
PE=PE1+TF*(PE2-PF1)	026420	SP-PECHK 46	
611 11 140	026430	SR-PECHK 47	
C BRACKET DELTAT WITH DLTT VALUES CORRESPONDING IN IDELII AND IDELI2	026440	SR-PECHK48	
	_	SR-PECHK 50	
110 DG 120 [=1,0NDT	026470	SR-PECHK51	
If (DELTI=1) (0 TO 12) TR.DILIAI.GE.PLT(I+1) 60 TO 120 IDELT=1	026480	SR-PECHK52	
IDELT2=1+1	026500	SR-PECHK53	
50 TO 130	026510	SPPECHK55	
STOP 'IN PECHK: FATIEN TO BRACKET DELTA T +	026520	SP-PECHK56	
	026550	SR-PECHK58	
C. PERFORM A TWO DIMENSIONAL FOURT INTERPOLATION USING TWO PANGE. C. POTNITS FOR EACH OF TWO DELAY TIME WAS HER	026550	SR-PECHK 59	
	026560	SR-PECHK60	
130 FDT DELTAT DLTT (IDELT)	026580	SP-PECHK62	
FD12=FD1/(DL11(IDELT2)-DLTT(IDELT1)) FDT1+1 A-FDT3	026590	SP-PECHK63	
T D 1 L L L O L L D 1 Z L O L L D 1 Z L O L L D 1 Z L O L D 1 Z L O L D 1 Z L O L D 1 Z L O L D 1 Z L	026600	SR-PECHK 64	
TF1=1,0-TF2	026610	SP-PECHK65	
II1* INDEX(ICC, IDELT1, IMUTS)	026620	OK - PECHK 66	
II2=INDEX(ICC, IDFLT2, IMMTS)	026640	SP-PECHKAR	
IVLA=MINO(10,IUL)	026650	SP-PECHK69	
PETINTAPETBL(III)IVLA)IRMGI) PFTIDO#DFTBL(III)IVLA,IRMGO)	026660	SP-PECHK70	
PET2R1=PETBL(II2,IVLA,IRNG1)	026670	SR-PECHK71	
PET2R2=PETBL(II2,IVLA,IPNG2)	02960	SK-PECHK /Z	
IF (IDELT2.Eq.6) PET2P1=0.0	02620	CR-PECHK74	
IF (IDELT2.EQ.6) PET2R2=0.0	026710	SPPECHK 75	
rc=ruix,irix,rtirix,rtii/ix,i;2*PE11P2+fDT2*Tf1*PET2P1+f0T2*Tf2*Tf2*DF2026720	R2026720	SR-PECHK76	
140 RN22=URAH31(IR22)	026730	SR-PECHK77	
KTEST(17,KRF)=KTEST(17,KRF)+1	026750	SR-PECHK 70	
IF (RN22,LE,PE) GU TO 150	026760	SR-PECHK80	
7 1 8 B T = 1 7	026770	SP-PECHK81	
CALL ARRITE (TARDI)	026780	SP-PECHK82	
	056790	SR-PECHK 83	
150 RETUPH	026800	SR-PECHK84	
ENO	010070	SKILCTINGS	
	026920	SK-PECHK86	

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D (PAGE 64 OF 82)

is H	SUBRIGHTINE PENAME (TP, IDT, VEL, GTR, REFL, ANGLET, DEFR, TGTHD, SKSEN, IDCODE)	026840 026850 026850	SP-PENAME2 SR-PENAME3 SR-PENAME4	
ن و	COMMON /XVALUE/ XVALUE(8,9,9,2)	001100	CM+XVALUE2 SP-PENAME6	
>	INFRACTION AVAILOR V. 13 N. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.	026890	SPPENAME7 SPPENAME8	
⋖	AVALUE(1)=TP,	026910	SR-PENAME9	
⋖・	4VALUE(2)=IDT	056920	SR-PENAM11	
⋖⋖	AVALUE(4)=VEL AVALUE(4)=GTR	026940	SR-PENAM12	
∢ .	AVALUE(5)=RFFL	05 69 20	SP-PENAM14	
<< <1	AVALUE(6)=AM5.L t ΔVALUE(7)=DEF8	02 69 70	SP-PENAM15	
. ◀	AVALUE(8)=TGTHD	086920	SP-PENANIS SP-PENANI7	
⋖	AVAL(1E(9)=SK5E11		SR-PENAM18	
a	00 110 J=2,º	027010	SP-PENAMIS SP-PENAMIS	
_ ~	10 100 1=1,8 F (ARCIANA) F(1) = XVALUF(1,3,1) (510001) GN TN 100		SR-PENAM21	
- 4	2-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1	027040	SR-PENAM22 SR-PENAM23	
9 0		05 7 0 6 0	SP-PENAM24	
	STOP * IN PENAME: ERROR HUMPER 1 *	027070	SP-PENAM25 SP-PENAM25	
110	CONTINUE	05 7 0 9 0	SR-PENAM27	
		027100	SR-PENAM28	
	IF (NP(J).GE.8) STOP * IN PFNAME: EPROP NUMBEP 2 *	027120	SP-PENAM30	
021		027130	SP-PENAM31	
	IF (TR.LE.O.O.OR.TR.GE.000.5) STOP ' IN PENAMF: ERROP NUMBER 3'	027150	SR-PENAM33	
_	NCUDE=IR+•50	027160	SR-PENAM34	
	DN 130 J=2,9	027170	SR-PENAM35	
130	NCUDE=8#MCUDE+NP(J)	027190	SR-PENAM37	
	EMCNDE (10,170,IrcnDE) (ICnDE	027200	SP-PENAM38	
-		02 72 20	SE-PENAM40	
		027230	SR-PENAM41	
*	***	027250	SP-PENAL42	
	ENTPY PEIDNT	027260	SR-PENAM44	
		02 7280	SP-PENAM46	
	DECORE (10,130,1000) HUMP	027290	SP-PENAM47	
	DN 140 J≈2,9	027300	SP-PENAM48	
	NP(11-J)=NOD(HCOOF,8)	02 7310	SP-PENAM49 SP-PENAM50	
140	NCHDE TRUE CHITINE	02 7330	SP-PENAM51	
		027350	SPIPENAMSS	
	NP(1)=MCODE	027360	SP-PENAM54	
		027370	SP-PENAM55	

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D (PAGE 65 OF 82)

0 1 1 0 1 1 0 0 1 1 1 0 0 1 1 1 1 0 0 1			
IF (A8S(FLOAT(NP(J))-XVANNF(T.J.2)).GIOOOJ) CD ID JED	027380	SR-PENAM56	
AVALUE(J)=XVALIJE(I,J,I)	05/300	SP-PENAMS/	
	027410	SP-PENAMSO	
TOU CONTINUE	027420	SP-PENAM60	
STUR THE PENAME (PEIDHIT): FRROP NUMBER 4 *	027430	SR-PENAM61	
	027440	SR-PENAM62	
AVALUE(1) = NCODE	027450	SP-PENAM63	
	027720	OP-PENAMOS	
TR=AVALUE(1)	027480	SP-PFNAM66	
IOI * AVAL UE (2)	057490	SP-PENAM67	
VILLEAVALUE C. V. C. T. C. C. C. C. C. C. C. C. C. C. C. C. C.	027500	SPPENAM68	
0 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	027510	SR-PENAM69	
AMELITY ANALOG (3)	027520	SR-PENAM 70	
OF FRANKLING TO	027530	SR-PENAM71	
TOTION AVAILABLE	027540	SR-PENAM72	
7 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	027550	SR-PENAM73	
	027560	SP-PENAM74	
PETUBLI	02220	SR-PENAM75	
	027580	SR-PENAM76	
	05 2 2 5 9 0	SR-PENAM77	
** * FORMAT STATFMENTS * * *	027600	SR-PENAM 78	
	027630	ON TENANTS	
170 FORMAT (4HPE00,R6)	020120	OK-PENAMBO	
180 FORMAT (4%,P6)	05/20	SR-PENAM81	
CZL	052640	SPPENAM82	
)	027650	SR-PENAM83	

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D (PAGE 66 OF 82)

```
CM+HIT 3
CM+HIT 3
CM+HIT 4
CM+KTEST 2
CM+KANOOM2
CM+RANOOM3
CM+RANOOM4
CM+RANOOM4
CM+TARGET2
CM+TARGET2
SR-PKCHKI1
SR-PKCHKI1
SR-PKCHKI1
SR-PKCHKI1
SR-PKCHKI2
SR-PKCHKI3
SR-PKCHKI3
SR-PKCHKI3
SR-PKCHKI3
SR-PKCHKI3
SR-PKCHKI3
SR-PKCHKI3
SR-PKCHKI3
                                                                                                                                                                                                                                                                                                                                                                     SR-PKCHK18
SR-PKCHK19
                                                                                                                                                                                                                                                                                                                                                                                                                                  SR-PKCHK22
SR-PKCHK23
                                                                                                                                                                                                                                                                                                                                                                                                      SR-PKCHK 20
                                                                                                                                                                                                                                                                                                                                                                                                                     SR-PKCHK 21
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    SP.-PKCHK25
                                                                                                                                                                                                                                                                                         027780
027790
027800
027810
027820
027830
                                                                                                                                                                                                                                                                                                                                                                                                                   027860
027870
027880
027890
                                                                                                                                 COMMON /KTEST/ KTEST(20,6)
COMMON /KTEST/ KTEST(20,6)
COMMON / RANDOM/ IR1, IR2, IR3, IR4, IR5, IR6, IR7, IR8, IR9, IR10,000640
COMMON / RAL2, IR13, IR14, IR15, IR16, IR17, IR18, IR19, IP20, IR21000650
Z , IR22, IR23, IR24, IR25, IR26, IR27, IR28
COMMON / RPLCTH/ KREP, KRE, KRF, NREW
COMMON / RPCCSS/ RNOREC(6)
COMMON / SCCSS/ RNOREC(6)
COMMON / ARREST/ IVEL, NVEHCL, OISBUH, ITGITP, IMUTS, ITGITS
O01000
                                                                                                                                                                                                                           001000
027750
                                                                                                                                                                                                                                                          027760
                                                                               000410
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  027900
                                                                                                                               000490
                                                                          COMMON /IIIT/ INOEX(6,5,2), PETBL(60,10,7), DLTT(6), PKTBL(10,2), NRNGTT, RHGTTE(20), TTF(3,20,2), HRNGPS, RNGPST(10), PSTTBL(10,2,3)
                                                                                                                                                                                                                                                            PK=PKTBL(ITGTTP,ITGTPS)
RN21=URAN31(IR21)
KTEST(19,KRT)=KTEST(19,KRF)+1
IT (PN21,LE,PK) GN TO 100
                                                                                                                                                                                                                                                                                                                                                                                                          RIBREC(KRF)=RHORFC(KRF)+1.0
NVEHKL=MINO(NVEHKL+1, NVFHCL)
                                                                                                                                                                                                                                                                                                                                            IABRT=19
CALL ABRTTL (IABRT)
GO TO 110
                                                     SUBROUTINE PKCHK
                                                                                                                                                                                                                                                                                                                                                                                                                                                       110 RETURN
                                                                                                                                                                                                                                                                                                                                                                                                             100
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LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D (PAGE 67 OF 82)

D-69

6789012345678901	23456789	01234567890	(READ VERTICALLY)
	027420	SR-PPI OT 2	
	027930	SR-PPLDT 3	
	000840	CM+RUNDAT2	
	027950	SR-PPLOT 5	
	027960	SR-PPLOT 6	
	027970	SR-PPLOT 7	
	027980	SR-PPLOT 8	
	05 7 9 9 0	SR-PPL UT 9	
	028000	SR-PPLOT10	
	028010	SR-PPLOT11	
	028820	SR-PFLOT12	
	028030	SR-PPLOT13	
	028040	SR-PPLOT14	
	1028050	SR-PPLOT15	
	058060	SR-PPLOT16	
	028070	SR-PPL0117	
55556666666666777 6789012345678901	34567890	1888888889	COLUMN NUMBERS
- 10-0	######################################	255666666666777777777777777777777777777	6777777778 9012345678901 027920 027920 027930 027950 027960 027980 027980 027980 028010 028020 028020 028040 028050 028050 028050 028050 028050 028050 028050 028050 028050 028050 028050

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D (PAGE 68 OF 82)

```
SP-PSHOK 11
SR-PSHOK 11
SR-PSHOK 12
SR-PSHOK 13
SP-PSHOK 14
SR-PSHOK 15
SR-PSHOK 15
SR-PSHOK 16
SR-PSHOK 18
SP-PSHOK 18
SP-PSHOK 20
SP-PSHOK 20
SP-PSHOK 20
SP-PSHOK 20
SP-PSHOK 21
SP-PSHOK 22
SP-PSHOK 22
SP-PSHOK 23
                                      SR-PSHOKE2
SR-PSHOKE3
SR-PSHOKE4
CH-SHOKE03
CH-WEATHR2
CH-WEATHR2
CH-WEATHR4
SR-PSHOKE9
SP-PSHOKE9
SP-PSHOKE9
                                                                                                                                      028140
028150
028160
028170
028180
028200
028200
028200
028200
                                                                                                                                                                                                                                                                                    028260
028270
028280
028290
028300
                                                                                                                                                                                                                                                              028240
                                       028090
028100
028110
000920
000930
001050
001070
                                                                COMMON /SMOKED/ SMKZ(3,3,2), SMKS(3,3,2), FRONT, NSMK2, NSMK5, 1 PSMKKL
COMMON /WATHIR/ PRCLCG, PRCFLS(2), PRGCFL(11,2), W(6,11,2), (OMMON 1, VIS(11), CLUUC(6), HCC, HVL, PASQL(6), WHOSPD(3,3), HUHID(2), 2 WSUM(2), WCFSUM(2), ICC, IVL
                                                                                                                                                                                                                           VSMR=FLOAT (NSMK) / SMK2(I+)+FLOAT (NSMK5) / SMK5(I+)+K)
VSMR=AHIH (FRONT, VSHK)
PASQT=PASQL(2*I-1)+PASQL(2*I)
PSMKKI=PSMKKL+PASQT*WHOSPO(I+)+HHHHD(K)*VSHK
                                                                                                                                                                00 100 I=1,3
JENO=1
IF (I=60.2) JEND=3
00 100 J=1,JFNO
00 100 K=1,2
                                                                                                                                                                                                                                                                                                       PSMKKL * PSMKKL/FRONT
                                           SURPRINTINE PSMOKE
                                                                                                                                                                                                                                                                               100 CONTINUE
                                                                                                                                                                                                                                                                                                                               RETURN
END
                                                          υv
                                                                                                                                                          C
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LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 69 OF 82)

	SUBROUTINE REINTZ	028320	SR-REINTZ2	
	COHMON /ABORT/ NABORT(20,6), HSABLH	028330 000110	SR-REINTZ3 CH+ABORT 2	
	COMMON /KTEST/ KTEST(20,6) COMMON /RANGON/ IRL, IR2, IR3, IR4, IR5, IR6, IR7, IR8, IR9, IP10,000440	000440	CM+KTEST 2	
	I IRII, IRIZ, IRIZ, IRI4, IRI5, IRI6, IRI7, IPI8, IRI9, IRZO,	IR20, IR21,000650	CM+RANODM3	
	: » IRCC» IRCS» IPC9» IRCS» IRC6» IRC7» IRC8 COMMON /RPLCIN/ RPFP» NPFP» RPF. NPF. NMEHW:	000000	CM+RANODM4	
	COMMON /SCCSS/ PHOREC(6)	006000	CM+SCCSS 2	
ی	OIMENSION IR(28)	028390	SR-REINTZ9	
S	E ALIT VALENCE (TD 41)	028410	SR-REINT11	
U	17416/T1417	028420	SR-REINT12 SR-RF1NT13	
	00 100 IKTEST*1,20	028440	SR-REINT14	
0	OU IOO JKIESI-IJ6 Kiesi/iviesi iviisi-a	028450	SR-REINT15	
2		028460	SR-REINT16	
	RNDRFC(J)=0.0	028470	SR-REINT17 SR-REINT18	
	DO 110 I=1,20	028490	SR-REINT19	
	NABORT (191)=0	028500	SR-REINT 20	
120	CONTINUE	028510	SR-REINT21	
		02620	SP-REINIZZ	
	K=1	028530	07-RE1N103	
	M=2**25	028550	SR-REINT25	
	DN 130 I=1,28	028560	SR-REINT26	
	TR(I)=2+(M*K/29)+1	028570	SP-REINT27	
130	CONTINUE		SR-RF1NT 29	
			SP-REINT30	
	IF (IPRINT.EQ.O) WRITF (8,140) (IR(I),1=1,28) IPPINT=1		SR-REINT31	
	1. K. K. K. L. L. L. L. L. L. L. L. L. L. L. L. L.	028820	SR-REINT32	
	אפוסגיו	028630	SR-REINI33	
		010070	101111111111111111111111111111111111111	
*	* FORMAT STATEMIS * * *	028650	SK-PEINT36	
		028670	SR-REINT37	
7.4 T	140 FIRMAI (IH , ZIHPANOUM NUMBEP SEEDS :, //(10110))	028680	SP-REINT38	
	END	028690	SP-REINT39	

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D (PAGE 70 OF 82)

SR-RNOREL2 SR-RNOREL3 CH+HISC 2 CH+RNOCH2 CH+RANOCH3 CH+RANOCH4 CH+RPLCTN2 SR-RNOREL9 SR-RNOREL9 SR-RNOREL9 SR-RNOREL9 SR-RNORE12 SR-RNORE13 SP-RNORE14 SR-RNOPE15 SR-RNORE16 SP-RNORE17 SR-RNDRE18 SP-RNORE19 000770 028770 028770 028800 028810 028810 028820 028830 028860 028710 028720 000490 000540 028890 KTEST(15,KRF)=KTEST(15,KRF)+1 IF (PN17,LE,RFLIF) GO TO 100 CALL ABRITL (IARRI) RN17=UPAN31(1P.17) SUBROUTINE RHOREL IA8RT=15 100 RETUPH ENO v

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 71 OF 82)

00000	0000000001111111111122222222333333334444444444	188888889 COLL	UMN NUMBERS AO VERTICALLY)
ر	SUBROUTINE RIGGHK 028900 S	SP-RNGCHK2	
)	064000	M+KTEST 2	
	CUMMUN FRANCE OFFICE AXPPRO VISLINE PNONUM REAL MXORNG 000690 C	M+RANGE 2 M+RANGE 3	
,		M+RPLCIN2	
د	028950 SKRF)=KTEST(3,KRF)+1 028960 S	SR-RNGCHK / SR-RNGCHKB	
		SP-RNGCHK9	
ပ	028980	SR-RNGCH10	
	05830	SR-RNGCH11	
	CALL ABRITL (IABRI) 029000 S	SR-RNGCH12	
U	029010 3	SR-RNGCH13	
100	100 RETUPH 029020 3	SR-RNGCH14	
U	029030	SP-PNGCH15	
	END 029040 S	SR-RNGCH16	
0000C	00000000011111111122222222233333334444444444	1888888889 COLL 1234567890 (RE	UMN NUMBERS AO VERTICALLY)

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 72 OF 82)

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SP-SEPRE46
SR-SEPRE47
SR-SEPRE48
SR-SEPRE49
SP-SEPRE50
SR-SEPRE51
SR-SEPRE51
                                                                                                                                                                                                                                                                             SR-SEPRE26
SR-SEPRE27
SR-SEPRE28
SR-SEPRE30
SP-SEPRE31
SR-SEPRE31
SR-SEPRE33
SP-SEPRE33
                                                                                                                                                                                         SP-SEPRE19
SP-SEPRE19
SP-SEPRE20
SP-SEPRE21
SR-SEPRE23
SR-SEPRE23
SP-SEPRE23
SR-SEPRE23
                  CM+COMENTS
CM+LOGFLGS
CM+LOGFLG3
CM+LOGFLG3
CM+SYMBOL3
SR-SEPREC7
SR-SEPREC7
SR-SEPREC9
SR-SEPREL0
SR-SEPREL13
SR-SEPREL13
                                                                                                                                                                                                                                                                                                                                                                                                                                                                          SR-SEPRE 44
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       SR-SEPPE45
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               029500
029510
029520
029530
029540
                                                                                                                                                                                                                                                                                                                                                       029370
029380
029390
029400
029410
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029460
029470
029480
029050
0029070
000510
000520
000970
0029110
029110
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029210
029220
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029230
029330
029330
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      029499
                                                                                                                                                                                                                                                                                                                                                                                                                       029430
                  COMMON /COMENT/ CHENT(13,20), COMBUF(13), ICHNT, NIRC
COMMON /LOGFLG/ FIRSTL, SEGNIL, SPCL(70), SHRTEC, FISILL
LOGICAL FIRSTL, SFOHML, SPCL, SHPTEC, FTSILL
COMMON /SYMBOL/ BLAHY, DECPMT, ALFBFT(27), ANUMBP(11), SEP(5),
DIMENSION A(N1), B(N2,N3), NCPR(10)
DIMENSION A(N1), B(N2,N3), NCPR(10)
DIMENSION CM(10)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        10 CONTINUE

SFOMML=.TRUF.

ENCODE (120,350,CH(1))

CALL COMMNT (CM,10,.TALSE.,.TRUE.)

ENCODE (120,360,CH(1))

ENCODE (120,360,CH(1))

CALL COMMNT (CM,10,.FALSE.,.TRUF.)

GO TO 230

SO TO 240 I=73,78
    SUBROUTINE SEPREC (A,MI,B,NZ,M3)
                                                                                                                                                                                                                                                                                                                                                              IF (*NOT.FIRSTL) GO TO 220
FIRSTL=.FALSE.
OD 190 I=73,78
IF (NC'T' "
                                                                                                                                                                                                                                                                                                                                                                                                                                               250
                                                                                                                                                                                                                                                                                                                                                                                                                                                                               (MC(I).NE.3) GO TO 250
                                                                                                                                                                                                                                                              DO 150 1=1,N1
NC(1)=IDCHAR(A,N1,I)
DO 170 I=1,N1
IF (NC(I),NE.5) GO TO 170
                                                                                                                                                                                                                                                                                                                                                                                                                                               10
                                                                                                                                                                                                                                                                                                                                                                                                                                      200 I=63,72
(NC(I).NE.3) GD
                                                                                                                                                                                                        DO 130 J=1,10
130 P8(1,J)=BLAHK
DO 140 I=1,10
140 NCPR(1)=0
                                                                                                                                                                                                                                                                                           IF (NC(I), NE.5)
NC(I)=3
OU 160 J=1,10
NC(I+J)=1
OUT 180
CONTINUE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                     210 I=79,80
                                                                                                                     DO 100 I=1,10
CONTINUE
DO 110 I=1,80
NC(I)=0
DO 120 I=1,NZ
DO 120 J=1,N3
B(I,J)=BLANK
                                                                                                                                                                                                 130 I=1,80
                                                                                                                                                                                                                                                                                                                                                                                                                                                          CUNTINUE
                                                                                                                                                                                                                                                                                                                                                                                                                                       11
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                                                                                                                                                                                                 8
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180
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                                                                                                                                   100
                                                                                                                                                        110
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                                                                                                                                                                                                                                                                           150
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LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 73 OF 82)

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SR-SEPRE61
SR-SEPRE62
SR-SEPRE63
SR-SEPRE64
SR-SEPRE64
                                                                                                                                                                              SP-SEPRE66
SR-SEPRE67
SR-SEPRE69
SP-SEPRE70
SR-SEPRE71
SR-SEPRE73
SR-SEPRE74
SR-SEPRE74
SR-SEPRE74
SR-SEPRE74
SR-SEPRE75
SR-SEPRE76
SR-SEPRE77
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SR-SEPRE77
SR-SEPRE77
                                                                                              SP-SEPRE59
SP-SEPRE60
                                                                                                                                                                                                                                                                                                                                             SR-SEPRE31
SR-SEPRE31
SP-SEPRE32
SP-SEPRE33
SR-SEPRE34
SR-SEPRE34
SR-SEPRE34
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  SP-SEPRE94
SR-SEPRE94
SP-SEPRE95
SR-SEPRE96
SP-SEPRE98
SP-SEPRE99
SP-SEPRE99
                                                                                                                                                                                                                                                                                                                                                                                                                               SR-SEPRE87
SP-SEPRE88
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           SR-SEPRIOS
SR-SEPRIO3
SR-SEPRIO4
SR-SEPRIO5
                                                                        SP-SEPRE57
SP-SEPRE58
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        SP-SEPR106
SP-SEPR107
                                                                                                                                                                                                                                                                                                                                                                                                                                                                  SP-SEPRE90
                                                                                                                                                                                                                                                                                                                                                                                                                                                       SR-SEPRE89
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               SP-SEPRIOL
                                      029580
029590
029600
                                                                       029610
029620
029630
029640
029660
029670
029690
029700
029710
029730
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029760
029770
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029810
029820
029830
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029980
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                                                                                                                                                                                                                             052540
                                                                                                                                                                                                                                                                            029780
                                                                                                                                                                                                                                                                                      052620
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       030030
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      350 FORMAT (92H YOU MAVE SEQUENCE NUMBERS IN COLUMNS 73-78 OF TAPES. 030050
1 THEY WILL BE PERMOYED BY THE PROGRAM;)
360 FORMAT (91H HOWEVER, IF THE TEMPORAFY OPTION WAS USED TO PEAD IN A030080
1NY DATA, THE PESULIS MAY BE SUSPICIT.)
                                                                                                                                                                                                                                                                                                                                                                                  029870
                                                                                                                                                                                                                                                                                                                                                                                                                    029900
                                                                                                                                                                                                                                                                                                                                                                      029860
                                                                                                                                                                                                                                                                                                                                                                                                                                                                              029950
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         096620
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      030040
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                030050
                                                                                                                                                                                                  60 TO 260
IF (NC(I).Eq.3.OR.NC(I).Eq.4.OR.IM.NE.IX) GO TO 290
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  STATFHFHTS * * *
                                                                                                                                                                                                                                                                                                                                                                                                                                                                       CONTINUE
DO 340 I=1,HRF
KCHAR=NCPR(I)
ENCNDE (80,370,B(1,I) )(PB(J,I),J-1,KCHAR)
                                                                                                                                                                           F (MC(I).NE.3.0P.IW.HE.IX) GO TO 280
                                                                                                                                                                                                                                                                                                                                                                                                                 IF (MRE.GE.O.AND.URE.LE.10) GO TO 330 STOP ' IN SEPREC: ERROR HUMPER 1 '
                                                                                                                                                                                                                                              60 T0 310
IF (HC(I).NE.4) GD T0 310
IF (I.NE.(LSTCMA+1)) GD T0 300
                                                                                 SEPARATE RECORDS ON INPUT CARD.
                                                                                                                                                                                                                                                                                                                   60 10 270
IF (MC(I), Eq. 3) 60 TO 270
                                                                                                                                                                                                                                                                                                                                                                                                                                                    ENCODE RECORDS INTO R APPAY
                                                                                                                                                                  260 IF (I.GT.N1) GO TN 329
                                                                                                                                                                                                                                                                                                                                                       PB(JsIW)=A(I)

MCPP(IW)=MCPR(IW)+1

GD TB 270

CONTINUE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  *** FORMAT
                                  NC(I)=3
240 CONTINUE
250 CONTINUE
                                                                                                                                                       L S TC MA = 0
                                                                                                                                                                                                                                                                                                           LSTCMA=I
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         CONTINUE
                                                                                                                                                                                                                          [W≂IW+1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                PETURN
                                                                                                          1 = 1
I W = 0
I X = 0
                                                                                                                                                                                        270
                                                                                                                                                                                                               280
                                                                                                                                                                                                                                                            200
                                                                                                                                                                                                                                                                                               300
                                                                                                                                                                                                                                                                                                                                 310
                                                                                                                                                                                                                                                                                                                                                                                                                                                                          330
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LISTING D-1 FORTRAN LISTING OF

COPE PROGRAM - CONT'D

	SUBROUTINE SMOKE	030130	SR-SMOKE 2
٠		030140	SPSMOKE 3
,	CONNON /KIEST/ KIEST(20,6)	000490	CM+KTEST 2
	COMMON /PANDAM/ 181, 182, 183, 184, 185, 186, 187, 188, 189, 181	0,000640	CM+RANOOM2
	1 TR11, 1812, 1813, 1814, 1815, 1816, 1817, 1818, 1819, 1820, 1821000650	21000650	CM+RANODM3
	2 - 1822 1823 1824 1825 1826 1827 1828	099000	CM+RANOOM4
	COMMON /RPLCTH/ KREP, NREP, KRE, HRE, NVEHKL	000770	CM+RPLCIN2
	COMMON / SMOKEO/ SMK2(3,3,2), SMK5(3,3,2), FRONT, NSMK2, NSMK5,	000050	CM+SMDKE02
	1 824521	000030	CM+SMDKE03
	COMMON /WEATHR/ PRCLCG, PRCFLS(2), PRGCFL(11,2), W(6,11,2),	00100	CM+WEATHR2
	1 VIS(11), CLUDO(6), NCC, NVL, PASOL(6), WNDSPD(3,3), HUMID(2),	00100	CM+WEATHR3
	2 WSUN(2), WCFSUN(2), ICC, IVL	001080	CM+WEATHR4
٠		030200	SR-SMOKE 9
•	KTEST(5, KRE) = KTEST (5, KRE) + 1	030210	SP-SMOKE10
	RII3=UPAH31(1813)	030220	SR-SMOKE11
	IF (PN13.61. "SAKKL) 60 TO 100	030230	SR-SMOKE12
ن		030240	SP-SMOKE13
,	1 A B D T = 5	030250	SPSMOKE14
	CALL ABRILL (IASEI)	030260	SR-SMOKE 15
ر		030270	SR-SMOKE16
,	100 RETURN	030280	SR-SMOKE17
U		030290	SR-SMOKE18
•	ENO	030300	SR-SMOKE19

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 75 OF 82)

12345	00000000011111111122222222333333334444444444	7777778 345678º0	1234567890 1234567890	CDLUMN NUMBERS (READ VERTICALLY)
	SUBPRUTINE SMPLCO (A.ND1.ND2.MRS.HOR.IRNOM.XSMPL.ICLASS)	036080	SP-SMPLC02	
v		030330	SR-SMPLC03	
ı	OIMENSION A(NOI) NDS)	030340	SP-SMPLC04	
Ų		030350	SR-SMPLC05	
,	1.01.455=0	030360	SR-SMPLC06	
	RN=URAN31(IRNOM)	030370	SR-SMPLCD7	
	TE (RH-LT-1.0) 60 TO 100	030380	SR-SMPLC08	
		030390	SR-SMPLC09	
	CALL STRACE	030400	SR-SMPLC10	
	STOP . IN SUPLEME RANDOM HUMBER THO LARGE .	030410	SR-SMPLC 11	
U		030420	SR-SMPLC12	
100	100 CONTINUE	030430	SR-SMPLC13	
		030440	SR-SMPLC14	
	DO 110 I=1, NORM1	030420	SR-SMPLC15	
	IF (A(I.)).LE.RN.AND.RN.LT.A(I+1,1)) GO TO 120	030460	SR-SMPLC16	
110	110 CONTINUE	030470	SR-SMPLC17	
U		030480	SR-SMPLC18	
	CALL STRACE	030490	SR-SMPLC19	
	STOP * IN SMPLCO: FAILEO TO BRACKET RANDOM NUMBER *	030500	SR-SMPLC20	
U		030510	SR-SMPLC21	
120	120 XSHPL=A(I,NRS)+(RH-A(I,1))*(A(I+1,NRS)-A(I,NRS))/(A(I+1,1)-A(I,1))030520	030520	SR-SMPLC22	
	ICLAS	030530	SP-SMPLC23	
U		030540	SR-SMPLC24	
	RETURN	030220	SR-SMPLC25	
U		03020	SR-SMPLC26	
U		030570	SR-SMPLC27	
*	* * FORMAT STATEMENTS * * *	030580	SR-SMPLC28	
U		030200	SP-SMPLC29	
130	130 FORMAT (1H ,59H IN SHPLCD WITH RAHOOM NUMBER GREATER THAN 1.0)	030600	SR-SMPLC30	
	RN = 9F10.7)	030610	SR-SMPLC31	
	ENO	030620	SP-SMPLC32	
	**************************************	3777777	888888888	COLUMN NUMBERS
12345	1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890 (READ VERTICALLY)	34547890	01234567890	(READ VERTICALLY)

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D (PAGE 76 OF 82)

COLUMN NUMBERS (READ VERTICALLY) SR-TIMCHK2 SR-TIMCHK3 CM+FLAG 2 CM+FLAG 4 CM+FLAG 4 CM+FLAG 4 CM+FLAG 4 CM+FLAG 4 CM+FLAG 4 CM+FLAG 5 SR-TIMCHK9 SR-TIMCH12 SR-TIMCH13 SR-TIMCH13 SR-TIMCH14 SR-TIMCH14 SR-TIMCH14 SR-TIMCH14 SR-TIMCH14 SR-TIMCH14 SR-TIMCH14 SR-TIMCH14 SR-TIMCH14 SR-TIMCH14 SR-TIMCH14 SR-TIMCH14 SR-TIMCH14 SR-TIMCH14 030640 030650 000300 000310 000320 000490 001070 030770 030710 030720 030730 030750 030760 030770 030770 COMMON /FLAG/ FHDPEP, INM, IPPEPL, IDIGIL, IPRIY, IRNDOC, IT3FLG,
1 ENOFLG
LOGICAL FHOFLG, EHDRIP
COMMON /KIESI/ KIESI/ 20,6)
COMMON /RECTIV KPEP, NREP, KPE, NVEHKL
COMMON /RPLCTH/ KPEP, NREP, TINNOW, TOF, TBR, TIMFA, TIMRAL KTEST(11,KRF)=KTEST(11,KRF)+1 IF (TIMNOW-LT.OURLOS) 60 TO 100 IABPT=11 CALL ABRITL (IABRT) SUBROUTINE TINCHK 100 RETURN

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 77 OF 82)

D-79

	1000 TO 1000 TO 1000			SK-IIILE Z	
200	TACKING, 1401			SP-TITLE 3	
#U5	COMMON /STITLE/	SLVERS, VEPNAT(2)	0000950	CM+STITLE2 SP-TITLE 6	
CALL	DATE (DAT) TIME (TIM)			SR-TITLE 7 SR-TITLE 8	
WEI	E (6,150)		030880	SR-TITLE 9 SR-TITLE10	
WRIT	WRITE (6,160)			SP-TITLE11	
1100	100 1=1,4 E (6,170)			58-111612 CD-TTT1613	
100 CDNT	INUE			SP-TITLE14	
WR II	E (6,180)			SP-TITLE15	
00 J	00 110 I=1,8 WRITE (6.170)		030950	SR-TITLE 16 SR-TITLE 17	
110 011	THUE			SR-TITLE18	
WRIT	WRITE (6,190)		030980	SR-TITLE19	
LIGH	E (6,200)			SE-TIT1E21	
WP. IT	E (6,170)			SR-TITLE 22	
WP.II	(6,210)			SR-TITLE23	
1 4 3	F (6,220)			SR-1111E24	
WRIT	E (6,170)			SR-TITLE26	
WR II	TE (6,230)			SP-111LE27	
TLAM	E (6,170)			SP-111620	
HP.II	TE (6,170)			SR-TITLE 30	
WRIT	E (6,250)			SR-TITLE31	
L D O	UU 120 I=1,11 WRITE (6,170)		031110	SR-111LE32 SR-111LE33	
120 CONT	INUE			SP-TITLE 34	
LI AM	E (6,260)			SR-TITLE35	
HA I	E (6,170)			SR-1111E36	
WPIT	E (6,170)			SP-TITLE38	
WRIT	WRITE (6,280)			SP-TITLE39	
WRIT	(6,170)			SR-TITLE40	
00	30 1=1.5			SR-T111E42	
WRIT	E (6,170)			SR-TITLE43	
130 CUNT			031230	SR-TITLE 44	
E E	E (6,300)	SLVERS,VERDAT(1),VERDAT(2)		SP-1111645	
TI 4H	WRITE (6,310) 1	DAT, TIM		SR-TITLE 47	
00	.40 I±1,5			SR-TITLE48	
WRIT	WRITE (6,170)			SP-TITLE 49	
TAC CUM	INUE 'E (6.160)			SR-1111E3U	
PETU	RETURN			SP-TITLE 52	
				SP-TITLE53	
**	. X W	# * # V F Z U F * F V F	031330	SP-TITLES4	
	-		1		

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D (PAGE 78 Of 82)

COLUMN NUMBERS (PEAD VERTICALLY) 000000000111111111122222222333333333344444444555555556666666667777777888888889 123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890

SR-111166 SR-1111665 SR-1111665 SR-1111665 SR-1111666 SR-1111669 SR-1111670 SR-1111672 SR-1111674 SR-1111674 SR-1111674 SR-1111674 SR-1111676 SR-TITLE56 SP-TITLE57 SR-TITLE58 SR-TITLE59 SR-TITLE50 210 FOPHAT (III 31H*,34X,14HDAVID BARNHAPT,8X,15HJULIAN CHEPHICK,5X,15H031440 1DIANA FREDERICK,37X,1H*)
220 FOPHAT (III 31H*,34X,17HECHARD SANDMFYFR,5X,15HPICHARD SCUNGIO,5X,031460 114HNICHAEL STAKS,3RX,11H*)
230 FORHAT (III 31H*,34X,13HFOWARP STAUCH,0X,11HANNTE YOUNG,61X,1H*) 031470 240 FRMAT (III 31H*,32X,3HF-8ASED ON A PROPOSAL BY HEPBEPT FALLIN,58X,031400 260 FORMAT (1H JH*,36X,53HUNITED STATES ARMY MATERIEL SYSTEMS ANALYSIO31530 1S ACTIVITY,30X,1H*) 270 FORMAT (1H ,11H*,51X,23HGROUND WARFARE DIVISION,54X,1H*)
280 FORMAT (1H ,1H*,47X,31HSUPPORT WEAPONS ANALYSIS BRANCH,50X,1H*)
290 FORMAT (1H ,1H*,50X,26HSYSTEMS EVALUATION SECTION,52X,1H*)
300 FORMAT (1H ,1H*,40X,13HCOPE VERSION ,F3.1,15H CURRENT AS OF ,2A10,031580 310 FORMAT (1H , 1H*, 42X, 16HTHIS RUN DONE ON, A10, THAT TIME, A10, 43X, 1H*1031600 250 FORMAT (1H ,1H*,32X,48H-DONF AT THE REQUEST OF DAVID MARDISON (DUSO31510) 1A-OR),48X,1H*) 031520

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D (PAGE 79 OF 82)

0000	00000000111111111222222233333333333444444445555555556666666666	8888899 COLUMN NUMBE 4567890 (READ VERTIC	RS ALLY)
ر		SP-USET 2	
ر	031640 SR- CMMMMH /DVALUE/ D(70), DPRT, DDT, DIOM, DIDIGT, OSMK(2) 000280 CM+	SR-USET 3 CM+OVALUE2	
	1 000510	:M+LDGFL62	
	SPCL, SHRTEC, FTSILL 000520 (:M+LOGFLG3	
	0002000	CM+OVER 2	
	_	CM+UVALUE2	
ر	031690	SR-USET 8	
		SP-USET 9	
	031710	SR-USET 10	
	031720	SR-USET 11	
	031730 : 031730 :	SR-USET 12	
100	CONTINUE 031740	SP-USET 13	
د	031750	SR-USET 14	
	031760	SR-USET 15	
	031770	SP-USET 16	
	031780	SR-USET 17	
	031790	SR-USET 18	
	031800	SR-USET 19	
	2) 031610	SR-USET 20	
,	FTSILL=.TRUE. 031820 SP-	SP-USET 21	
U	031830	SR-USET 22	
	JPN 031840	SR-USET 23	
	END 031850 SR-1	SR-USET 24	
0000	00000000011111111112222222222333333333444444455555556666666666	8888889 COLUMN NUMBER 4567890 (READ VERTICA	2S 4(LY)

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D (PAGE 80 OF 82)

0000000001111111111222222222333333334444444444	,666666777777778888888899 COLUMN NUMBERS 1456789012345678901234567890 (REAO VERTICALLY)
SUBROUTINE VISCHK	031870 SP-VISCHK2
U	031880 SR-VISCHK3
COMMON /KTEST/ KTEST(20,6)	000490 CM+KTEST 2
COMMON /RANGE/ DIENG, MXDRNG, VISLIM, RNGNOW	000680 CM+RANGE 2
REAL MXDRNG	
COMMON /RPLCTN/ KREP, HREP, KRF, HRF, HVEHKL	
	031920 SR-VISCHK7
KTEST(2, KRF) = KTEST(2, KRF) + 1	031930 SP-VISCHK8
IF (DTPNG.LF.1000.*VISLIM) GD TD 100	031940 SR-VISCHK9
C	031950 SR-VISCH10
IA8RT=2	031960 SR-VISCH11
CALL ARRITL (IARET)	031970 SR-VISCH12
· ·	031980 SR-VISCH13
100 RETURN	031990 SP-VISCH14
U	032000 SP-VISCH15
END	037010 SP.~VISCH16
00000000011111111122222222333333334444444444	5666666777777778888888888 CQLUMN NUMBERS 256777777777788012888888888 CQLUMN NUMBERS

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D

(PAGE 81 OF 82)

SUF	SUBRUUTINE WARNDO		70 05	
iuo S	032040 COMMON /FLAG/ ENDREP, IDN, IPREPL, IOIGTL, IPRIY, IRNOGC, 113F1G, 000300	CM+FIAG 2	200	
1		_	m	
60		-	4	
55	COMMON /FIEST / FIEST		5T 2	
	LUMMON /FANDUM/ IRI, IR2, IR3, IR4, IR5, IR6, IR6, IR7, IR8, IR9, IR10,000640 - IR11, IR12, IR13, IR14, IR15, IR14, IR14, IR17, IR18, IR18, IR10, IR20, IR20, IR210,	CM+RANOOM2	00M2	
. ~	• IR22, IR23, IR24, IR25, IP26, IP27, IP28	_	00 M 4	
100	COMMON /RPLCIN/ KPEP, NRFP, NRF, NVEHKL 000770	_	11N2	
Cu	COMMON /RSPIN/ BATRIM(3), XMVADF(2), DUM1, RCSPIM(2,2), XMIIIM(2,000790	O CM+RSPIIM2	r I M2	
-	2); TMEAN(2,2); TSIGMA(2,2); OETTMA(10,2); NOT; TRARRY(3,2); 000800	CM+RSPIIM3	rim3	
2	, ALPHA(2,2), BETA(2,2), OFITIM,	_	LIM4	
m			LI M5	
00	CONMON /TIME/ OURLOS, TIMHOW, TOF, TBR, TIMPA, TIMRAL 001020	_	2	
U			1010	
KT	KPF1+1		1011	
I.F.	0 0 10 100		1012	
II			1013	
Z.			4014	
IE	TE (PN16.LE.PRODW) GO TO 100 032160		1015	
ن			1016	
IAE			4017	
CAL	CALL ABRITL (IABRI) 032190		1018	
U		SR-WARNOI9	1019	
100 RFTURN		D SR-WARN020	1020	
U	032220		1021	
ENO	0322230	SR-WARNOZZ	1022	

LISTING D-1 FORTRAN LISTING OF COPE PROGRAM - CONT'D (PAGE 82 OF 82)

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    THE HEXT CARD SIGNALS FORMATTED OATA IS TO BE READ INTO RANDOM
    DOCURENCE DATA BLOCK
    TEMP, RODIST

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$ THE DVERRIGE CARD WHICH FOLLOWS DVERPIDES THE NORMAL CHOICE OF

$ PE DATA WITH THE PE DATA RECORD MAHED PEODAJAAJS

$ HOTE THE USE OF THE $ BEFORE THE RECORD NAME

TOVERPIDE, PEOATA, $ PEOAJAAJS
                                                                                                                                                                                                                                                                                                                                                                                                                                                    COMMENT WILL BE PRINTED ON CASE 3 HEADING PAGE
     $$$ THIS COMMENT WILL APPEAR DN THF $$$ COMMENT PAGE WFATHER, JUNE, 0600
ACQRNGOIST, CLOSE
PLOT, PRINTER, ON
                                                                                                                                                                                                                                                                                                                                                                                                                                       3000.0
                                                                                                                                                                                                                                                                                                                                                                                                                                     2000.0
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                SMDKF, SMKRNDS, 200, 400
                                                                                                                      OESIGTYPE, MULE
RESPTINE, PARAM, 150, N
CONTRUL, ECHO, LONG
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         NEXT CASE, RD
REFLECTIVITY, 3
SMOKF, PRESMOKE, 15
                                                                                                                                                                                                                                                                                                                                                                                                                                       1500.0
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$$ THIS COMMENT V

TAPGET TYPE,4

OFIEESUPPP,HUHE

RUHC,200
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                                                                                                                                                                                                                                                                                          NEXT CASE, RO
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       NUMVENITGT,6
OISTBVFH,50
                                                                                                         CASE,OR
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      ANGLE T,60
FIRST CASE
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LISTING D-2 SAMPLE INPUT FOR COPE

D-85

JOB CARD. CHANGE THIS CARD TO CONFORM TO INSTALLATION USAGE.
ACCOUNT CARD. CHANGE THIS CARD TO CONFORM TO INSTALLATION USAGE.
COMMENT. THE NEXT CARD DECLARES TAPFS TO HAVE RECORD TYPE Z AND BO CHARACTEPS COMMENT. PER LINE(RECORD).
FILE, TAPFS, RT=ZFL=00, BT=C.
COMMENT. THE NEXT STATEMENT DAFAGE.
COMMENT. A LOCAL FILE MANED TAPFS.
COMMENT. A LOCAL FILE MANED TAPFS.
COMMENT. THE NEXT STATEMENT CAUSES TAPFS (COPE INPUT) TO BE LISTED. THIS IS COPYSRF, TAPES.
COMMENT. THE NEXT STATEMENT ATTACHES THE PREVIOUSLY COMPILED (IN ANDTHEP JOB)
COMMENT. THE NEXT STATEMENT ATTACHES THE PREVIOUSLY COMPILED (IN ANDTHEP JOB)
COMMENT. DBJCT CODE EOR THE COPE PROGRAM.
COMMENT. DBJCT CODE EOR THE COPE PROGRAM.
ATTACH-LOCACOPESANDEED BAY NIE COPE PROGRAM.
COMMENT. THE NEXT STATEMENT ATTACHES THE COPE "DATA BASE" FILE (TAPEJJ) WHICH COMMENT.
AND SCREATED AND HODDED BY VIE COPE "DATA BASE" FILE (TAPEJJ) WHICH COMMENT.
AND STATEMENT ATTACHES THE TACH THE INTERNATIONAL MATHMATICAL AND COMMENT.
COMMENT. THE NEXT STATEMENT ATTACH THE INTERNATIONAL MATHMATICAL AND COMMENT.
COMMENT. THE NEXT STATEMENT ATTACH THE INTERNATIONAL MATHMATICAL LIBRARY (IMSL) AND DECLARE IT TO BE A LIBRARY TO BE ATTACH-TACH-TACH.

LIBRARY, INSL.
COMMENT. THE NEXT CARD DECLARES TAPES TO HAVE RECORD TYPE Z AND 140 CHARACTERS COMMENT.
THE NEXT STATEMENT BECORD TYPE Z IS THE OFF AULT RECORD TYPE.
COMMENT. FOR LINE. THIS IS DOHE BECAUSE TAPES IS TO BE SAVED ON THE "FORMENT END" COMMENT.
ELESTAPPES, RIPEZ, EL-140-RT=C.
COMMENT. THE NEXT STATEMENT LOADS AND EXECUTES THE COPE PROGRAM USING TAPES AS

LISTING D-3 SAMPLE RUNSTREAM FOR COPE

CONHENT. THE NEXT STATEMENT SAVES A CODY DE TAPER (COPE AUXILIARY OUTPUT)
COMMENT. ON THE "FRONT END" COMPUTER. THIS TAPER IS USED TO PRODUCE THE
COMMENT. LISTINGS OF SECTION 7.6 OF THE COPE PROCUMENTATION.
SAVEPE/JAPER, COPEAUXOUTPUT, ID. SALID NEYER, ST. MFA.

LISTING D-4 SAMPLE OUTPUT FROM COPE

(PAGE 1 OF 11)

FVALUATION PERFOPMANCE OFFPATIONAL COPPERHEAD

-PRICEAM BY RICHARD SANDHFYER

-MODEL DEVELOPMENT AND DATA COLLECTION BY:

DIANA FREDFRICK JULIAN CHEPINICK PICHARD SANDMEYER DAVID BAPNHAPT

RICHARD SCUNGIO

MICHAEL STARKS

FPWARD STAUCH

-BASED ON A PROPOSAL BY HEPBERT FALLIN

-DOME AT THE PRODEST OF DAVID HAPDISON (DUSA-OR)

UBLITED STATES ARMY MATERIEL SYSTEMS ANALYSIS ACTIVITY

GPOURD WARFAPF DIVISION

SUPPORT MEAPONS AHALYSIS RPANCH

SYSTEMS EVALUATION SECTION

THIS PUR DONE ON OB/14/RO AT TIME 15.41.16. CHPE VEPSIGH 6.2 CURPENT AS OF 6 MARCH 1980

LISTING D-4 SAMPLE OUTPUT FROM COPE

(PAGE 2 OF 11)

LISTING D-4 SAMPLE OUTPUT FROM COPE

(PAGE 3 OF 11)

5.55 5.55 5.55 5.55 5.55 5.55 5.55 5.55 5.55

COMMENTS FOR THIS SET OF CASES

** USFR ** THIS COMMENT WILL APPEAR ON THE \$\$\$ COMMENT PAGE

NUMBER OF REPLICATIONS*10000

# DETFCT. COHMO. AND PROC TIMES # # PRIOBITAL COHMO # DAY TIME # DAY TIME # DAY TIME # DAY TIME # DAY TIME # DAY TIME # DAY TIME # DAY TIME # DAY TIME # DAY TIME # DAY TIME # DAY TIME # DAY TIME # DAY TIME # DAY TIME # DAY TIME # DAY TIME # DAY TIME # PROB SUCESSFUL PIGITAL TPAN= 915 # # PROB CORPECT HESAGE = .075 # PROB OU WARNED TO LASE = .975 # ************************************	经专种代表保护的基本企业的基本企业的基本企业的基本企业的基本企业的基本企业企业企业企业企业企业企业企业企业企业企业企业企业企业企业企业企业企业企业	计标准分类表示表示表示表示表示表示表示表示的 医多种性性 医多种性 医多种性 医多种性 医多种性 医多种性 医多种性 医多种	中华中华古安安安安安安安安安安安安安安安安安安安安安安安安安安安安安安安安安安
# PRIORITY PPE-PLANNED TARGET # 01GTTAL COHMO # 10M TIME # 10M TIME # 10M TIME # PPOB SUCCESSTUL PIGITAL TPAN= .915 # # PROB CORPECT HESSAGE = .975 # PROB OWARNED TO LASE = .975 # PROB OWARNED TO LASE = .975 # ************************************	TAPGET	* DETFCT, COMMO, AND PROC TIMES *	* WEATHER
# * UDITIAL CUMMU * UDAY TIME * HOHIMAL RESPONSE TIME=106. SFC * PPOB SUCCESSIUL INGITAL TPAN=.915 ** * PROB CORPECT HESSAGE = .975 * * PROB CONPECT HESSAGE = .975 * **********************************	TYPE 1 **	* PRIOPITY PPF-PLANNED TARGET *	* MONTH OF JUN
# HUHITIAL RESPONSE TIME=106. SFC # PROB SUCCESSTUL DIGITAL TPAN= .915 # # PROB CORPECT HESSAGE = .975 # # *********************************		* OIGITAL COMMO **	* TIME OF DAY: 0600
* PPOB SUCCESSTUL PIGITAL TPAN= .915 * * PROB CORPECT HESSAGE = .075 * * PROB CORPECT HESSAGE = .075 * **********************************		* HUMINAL RESPONSE TIME=106. SEC *	***********************
* PROB CORPECT HESSAGE = .975 * PROB OU WARNED TO LASE = .975 * ***** **** *********************	TARGET HEADING= D. DEGREES *	* PPIB SUCCESSFUL PIGITAL TPAN= .915 *	
* * PROB OD WARNED TO LASE = .975 * * ********************************	* TARGET'S REFLECTIVITY* .10 *	* PROB CORRECT MESSAGE = .975 *	非非非常 计存储 计存储 计多数 计分析 计分析 计分析 计分析 计多数 计多数 计多数 计分析 计分析 计分析 计分析 计分析 计分析 计分析 计分析 计分析 计分析
**************************************	*******************************	* PROB OO WARNFO TO LASE = .975 *	
*** * *******************************		# \$P\$\$P\$\$P\$\$P\$\$P\$\$P\$\$P\$\$P\$\$P\$\$P\$\$P\$\$P\$\$P\$	# IERRAIN AND LUS
# #***********************************	古女子亦作古女女女女女女女女女女女女女女女女女女女女女女女女女女女女女女女女女女		NIVAGIL GVOID *
* * TYPE 1 * TYPE 1 * TYPE 1 * TAXIMUM DESIGNATOR RANGE=7000. M * * PESIGNATOR AND CENTOR *	· 李子子 李子子子 李子子子 李子子 李子子子 李子子子子 李子子 李子子子 李子子子 李子子子	* CONTINUOUS FOR CONTINUOUS CALL CO VIII	
# TYPE 1 # HAXINUH DESIGNATOR RANGE=7000. H # BAIL-OUT PANGF=100D. M # BAIL-OUT PANGF=100D. M # PATH-OUT PANGF=100D. M # PROB SUPPLESSED BY INDIRECT FIRE=.01 # # PROB SUPPLESSED BY DIRECT FIRE: HIGH # # PATH-OUT PANGF=100D. M # PATH-OUT PANGF=100	FIRING INFO *	*	* CONTINUOUS FUS ("SHUDIING GALLERI")
* TYPE 1 * TAYE 1 * ALIL-DUT RANGF=100D. H * DESIGNATOR ANTAGE POINT * * ********************************	*	* DESIGNATOR *	*****************
# TYPE 1 * HAXKHUM DESIGNATOR RANGE=7000. H * * A AIL—BUT PANGF=100D. M * * DESIGHATOR AT VANTAGE POINT * * ********************************	NUMBER OF ROUNDS PER ENGAGEMENT= 6 *	*	
* HAXIMUM DESIGNATOR RANGE=7000. M * * RAIL-UUT RANGF=100D. M * * DESIGNATOP AT VANTAGE POINT * * ********************************	POUND RELIABILITY= .96 *	* TYPE 1	***********************
* * RAIL-OUT PANGF=100D. M * * DESIGNATOP AT VANTAGE POINT * * ********************************	TIME BETWEEN ROUNDS* 20. SEC *	# MAXIMUM PESIGNATOR RANGE = 7000 . M *	*
* DESIGNATOR AT VANTAGE POINT * * ********************************	TIME OF FLIGHT= 31.0 SEC *	* BAIL-DUT PANGF=100D. M	* A DRACIIR ANTA
*** **********************************	NUMINAL GUN-TARGET RANGF = 8. KM *	* DESIGNATOR AT VANTAGE POINT *	*
*** ******************* **** **** ****	AMGLE T= 25. DEGREES *	*	# PROB SMOKE KILLS MISSION# .75
** ***********************************	DFFLECTION 81AS= D. METFRS *	李宁李宁大学李子子李子李李子李子李子李子李李子李帝李子子李子子李安子子李	
** * OFSIGNATOR SUPPRESSED * * * PROB SUPPRESSED BY INDIRECT FIRE=.01 * * * PROB SUPPRESSED BY DIRECT FIRE: HIGH * * * ******************************	安代安全的非常并在安全的自治学的专业专业专业的法学会专业的专业的法学的法学的专业专业的专业	各种种种种种种种种种种种种种种种种种种种种种种种种种种种种种种种种种种种种种种	* PROR DUST KILLS MISSION= .37 *
**		*	***************
****	化多角线 经非常的的 经存货的 医克克特氏病 医克克特氏病 医克克特氏病 医克格特氏征 医克格特氏征 计多数记录	* OFSIGNATOR SUPPRESSED *	
***	HISC ++	* PROB SUPPRESSED BY INDIRECT FIRE 01 *	
*	DELTA T3 ASSUMED TO 8E ZERO ** SFFKEP SENSITIVITY= 60. JOULES/H**2 *	* PKUB SUPPRESSEU BY DIRECT FIRE: HIGH & * * * * * * * * * * * * * * * * * *	
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LISTING D-4 SAMPLE OUTPUT FROM COPE

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\$9

COMMENTS

** CAPE ** IN PPLOT FOR CASE 1 WITH IPPFG= 1 . HO PLOT PPOPUCED .

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(PAGE 4 0F 11)

													9	345(3,45%) 702(50,85%)	0(0.00%) 357(100.0%)	144(1,44%) 357(59,66%)	13(0,13%) 213(93,90%)	29(0,29%) 200(85,50%)	0(0.00%)	49(0,49%)	64(0.64%) 122(47.54%)	58 ****	. 58% 5.76% 8.26% 47.16%	657(78,54%)
													īU	242(2·42%) 702(65·53%)	0(0.00%)	164(1.64%)	9(0.09%)	46(0,46%) 287(83,97%)	0(0.00%)	43(0,43%) 241(82,16%)	96(0.96%) 198(51.52%)	102	1.02% 10.13% 14.53% 60.77% SN)= 10.07%	f)
	10000(99.16%)	9916(95.81%)	9501(100.02)	9501(100.02)	9501(25.03%)	2378(62,70%)	1491(67.54%)	***	1007(93.05%)	937(97.76%)	916(82.647)	757(92.73%)	4	151(1.51%) 702(78.49%)	0(0.00%) 551(100.0%)	183(1.83%) 551(66.79%)	16(0.162) 368(95.652)	55(0.55%) 352(84.38%)	2(0.02%) 297(99.33%)	54(0.54%) 295(81.69%)	128(1.28%) 241(46.89%)	113	1.137 11.227 16.107 72.795 PPOB(ATMP EHG/NCSN)	NUMBER TESTED (7 NOT KILLEN) FROM COPE
***** (0000	D (% PASSFD):	D (% PASSED):	D (% PASSED):	O (Z PASSED):	D (Z PASSED):	O (Z PASSEO):	HUMBER TESTED (7 PASSED):	(1007)	O (Z PASSED):	D (Z PASSED):	O (Z PASSED):	NUMBEP TESTED (% PASSED):	702) *****	96(0,96%)	0(0.002)	194(1.04%)	15(0.15%) 412(96.36%)	83(0,83%) 397(79,09%)	4(0.04%) 314(98.73%)	74(0.74%) 310(76.13%)	104(1.047)	132	1.327 13.117 18.807 80.057 69.712	417.) OUTPUT
* DCCASIONS (10000)	NUMBER TESTED	NUMBER TESTED	HUMBER TESTED	NUMBER TESTEO	NIMBER TESTED	NUMBER TESTED	NUMBER TESTE	ATTEMPTED ENGAGEMENTS	NUMBER TESTFO	NUMBER TESTED	HUMBEP TESTEO	NUMBEP TESTE	***** \$110TS (62(0.62%) 702(91.17%)	010,002)	173(1,73%) 640(72,97%)	16(0.16%)	61(0.61Z) 451(86.47Z)	1(0.01%)	83(0.832) 389(78.662)	159(1.59%) 306(48.04%)	147	1.472 14.607 20.942 84.547 ATRP ERG)=	, S
***	84(0.84%)	415(4,155)	0 (0.00%)	0 (0.00%)	7123(71,23%)	887(8.872)	484 (4.842)	**** AT	70(0.70%)	21(0.21%)	159(1.50%)	55 (0.552)		30(0.30%) 702(95.73%)	15(0.157) 672(97.777)	176(1,767) 657(73,212)	20(0.20%)	54(0.54%) 461(88.20%)	1(0.012)	105(1,05%)	156(1,56%) 301(48,17%)	145	1,457 14,407 20,667 86,777 PROB (SHUT/ATRP	IICH DESIGNATOR KILLED LISTING D-4
CAUSE OF ABORT	DESIGNATOP IN INDIRECT FIRE	TAPGET BEYOND VISIBILITY RANGE	TAPGET REYOND DESIGNATOR RANGE	TARGET HOT DETECTED	SHOKE KILLEP MISSION	PUST KILLFD MISSION	PESIGNATOR BAILED-OUT PRE-COMM		COMMO OUT (BOTH VOICE & DIGTL)	FPEOR IN TRANSMISSION	DESIGNATOP BAILED-NUT POST-COM	LOS LOST - NO FIRING	P GUND NUMBEP :	LOS LOST DURING MISSION NUMBEP TESTED (% PASSED)	DESIGNATOR NOT WARNED IN TIME NUMBER TESTED (% PASSED)	DESIGNATOP IN DIPECT FIRE NUMBER TESTEO (% PASSEO)	ROUND RELIABILITY FAILURE NUMBER TESTED (7 PASSFD)	TAPGET DRSCURED BY MINI-TFRRN NUMRER TESTEN (3 PASSED)	POUND DID NOT ENGAGE TARGET NUMBER TESTED (7 PASSED)	ROUND ENGAGED BUT DID NOT HIT HUNBER TESTED (% PASSED)	ROUND HIT BUT DID HOT KILL NUMBRE TESTED (% PASSED)	**** KILLS	PROB(KILL/OCSN) = PROB(KILL/ATHP ENG) = PROB(KILL/SHIT) = PROB(LOS) = 7.025	DESIGNATOP SURVIVABILITY: CASES IN WHICH
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(PAGE 5 OF 11)

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* * * * * * * * * * * * * * * * * * *	NUMBFP OF REPLICATIONS=10000

TYPE 1 * * * * * * * * * * * * * * * * * *	DETECT, COMMO, AND PROC TIMES *	* WEATHER
THE VEHICLES=10	* PARAMETEPIZED RESPONSE TIMF=150. SFC *	* MONTH OF JUN
MEAN DISTANCE BETWEEN VEHICLES* 61.M *	PRIORITY PRE-PLANNED TARGET *. DIGITAL COMMO **	* TIME UF OAY: 0600 *
TAFGET VFL CITY=2. M/SEC * *	NIGHT TIME *	**********
TARGET HEADING 0. DFGREES * *	NOMINAL RESPONSE TIME=181. SFC *	
AFGEIS FILLCIIVIIY= .10 * * *	PROB SUCCESSFUL DIGITAL TPAN* .015 * PROB CORRECT MESSAGE * .075 *	***************************************
***************************************	PROB DO WARNED TO LASE = .075 +	* TFRRAIN AND LOS
· 中	1. 有一个有一个有一个有一个有一个有一个有一个有一个有一个有一个有一个有一个有一个有	2
		* CLOSE LERKAIN * CONTINUOUS 1 DS 4 #SUCOTING 6111 FROM
FIRING INFO * *	************	* CHRITHOUGS LOS ("SHUULING GALLERI")
*	*	*****
HUMBER OF ROUNDS PER EMGAGENENT= 6 * *	DESIGNATOR *	
FUUTE RELIABILITY= .96 * *	**	******
TIME BETWEEN ROUNDS. 20. SEC * *	TYPE 2 *	*
* TIME OF FLIGHT 31.0 SEC * * *	MAXINUM DESIGNATOR RANGE=2600. M *	# OBSCURANTS
MUNITUAL GOIFTIANGE KANGE 8. KM * *	BAIL-UUT PANGE=1000. M	*
ANGLE - CO. DEGREES # # #	PESIGNATOR AT VANTAGE POINT *	
*	*	* VOLUME OF SMOKE EIRED: 484 + 846
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LISTING D-4 SAMPLE OUTPUT FROM COPE

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TYPE 4 ** ** NUMBER OF VEHICLES= 6 **	* PRIORITY PPE-FLANNED TARGET * * * DIGITAL COMMO **	* * MONTH OF DEC * TINE NF DAY: 2200
* MFAH DISTANCE BLIVEEN VEHICLES= 50.M * * TARGET VELOUITY=3. M/SEC * TARGET HEADING= 0. DEGREFS *	* DAY TINE * * HOMINAL RESPONSE TIME=106, SEC * * PORR VICESCELIA DESTAI TEAM OIE *	**************************************
TAFGET'S REFLECTIVITY= .10 *	* PROB COPECT MESSAGE = .075 * * PROB DO VAPMED TO LASE = .075 *	*****************
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* NUMBER OF POUNDS PER ENGAGEMENT= 6 *	* DESIGNATOP *	*************
96 10. SEC SEC AMGE= 8. KN	* TYPE 1 * HAXINUM DESIGNATOP RANGE=7000. H * * RAIL-QUT PANGE=1000. M * * DFSIGNATOR AT VANTAGE POINT *	**************************************
ANGLE TF. 25. DEGREES * PETLECTION BIAS= 0. METERS *	李章帝帝帝帝帝帝帝帝帝帝帝帝帝帝帝帝帝帝帝帝帝帝帝帝帝帝帝帝帝帝帝帝帝帝帝帝	* PROB SMOKE KILLS MISSION* .22 * VOLUME OF SMOKE FIRED: 200 + 400
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· 在	* DESIGNATOR SUPPRESSED *	******
MISC ** DELTA T3 NOT ACCIMEN 7EDO **	* PROB SUPPRESSED BY INDIPECT EIRF*.01 * * PROB SUPPPESSED BY DIRECT FIRE: NONE *	
* FUNC= 200.M * SFEKER SFMSITIVITY= 60. JOULES/M**2 *	· · · · · · · · · · · · · · · · · · ·	

₩ \$\$ **⇔ ₩ \$** \$\$ THIS COMMENT WILL BE PRINTED ON CASE 3 HEADING PAGE CHOICE OF DAY TIME FOR RESPONSE TIME DATA IS INCONSISTENT WITH TIME OF 2200 FOR WEATHER DATA TENDORARY OFTION IN EFFECT FOR RODATA \$ \$\$ \$\$ \$ **%** \$\$ COMMFNTS \$ ₩ **9**7 \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ ** USER ** ** COPE ** ** COPE ** \$\$ \$\$

LISTING D-4 SAMPLE OUTPUT FROM COPE

(PAGE 8 OF 11)

(PAGE 9 OF 11)

	ø	785(72.41%) 2845(72.41%) 0(0.00%) 2060(100.0%) 2060(100.0%)	80(0,80%) 2060(96.12%) 327(3,27%) 1980(83,48%) 242(2,42%) 1653(85,36%) 345(3,45%) 1411(75,55%)	226(2.26%) 21 1066(78.80%) 840 **** 8.40% 24.43% 29.53% 72.41% 38% = 2254(100.0%)
	in.	715(7,15%) 2845(74,87%) 0(0,00%) 2130(100,0%) 2130(100,0%)	87(0.87%) 2130(95.92%) 317(3.17%) 2043(84.48%) 209(2.09%) 1726(87.89%) 387(3.87%) 1517(74.49%)	217(2,17%) 1130(80,80%) 913 9,13% 26,56% 32,09% 74,87% 74,87% 165N)= 34,38% NUT KILLFO) = 22
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TARGET	* DETECT, COMMO, AND PROC TIMES *	* WEATHER
TYPE 1 *** NUNBER DF VEHICLES=10 ** MFAN DISTANCF RITUEEN VEHICLES= 61.4 **	* PPIGRITY PRE-PLANHEO TARGET * * * PLGITAL COMMO * * PAY TIME * * * * * * * * * * * * * * * * * * *	* * MONTH OF JUN * TIME OF 0AY: 1400
TAFGET VEL CITY=5. M/SEC * TARGET HEADING= 0. DEGREES *	* HOMINAL RESPONSE TIME=106. SEC * * PPIN NICESSEM OTETAL TRANSPORT	非非非常 化化合物 经分类法 化水黄素 医安格特 化安格特 医克格特氏 医克格特氏病 医克格特氏病 医克格特氏病
TAFGET*S REFLECTIVITY= .30 *	* PROB CORRECT MESSAGE = .975 * * * PROB DO WAPNEO TO LASE = .900 *	***
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* * * * * * * * * * * * * * * * * * *	***************************************	* AVERAGE TERRAIN * CONTINUOUS LOS ("SHOOTING GALLERY")
NUMBER OF ROUNDS PER ENGAGEMENT= 6 *	* nFSIGNATOP *	********************************
ROUND RELIABILITY = .96 * TINF BETWEEN ROUNDS 20, SEC * TIME OF FIGURE 3.0 5.0	* TYPE 1 * * NAXIMUM DESIGNATOR RANGE=7000. H *	*************************************
NOTION OF TRICKS STORE STORE **	* PAIL-OUT RANGE=1000. M * DESIGNATOR AT VANTAGE POINT *	* DBSCURANTS *
ATIGLE 15.60. OEGREES * OFFLECTION BIAS* O. METFRS *	安全安全的 医格特特氏 医克勒特氏 医克勒特氏 医克勒特氏征 医克勒特氏 医克勒特氏 医克勒特氏 医克勒特氏 医克勒特氏 医克勒特氏 医克勒特氏 医克勒特氏 医克勒特氏 医克勒特氏 医克勒特氏病	* PROB SMOKE KILLS MISSION= .15 * PROB DUST KILLS MISSION= .20
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* OFLTA T3 ASSUMEO TO BE ZERO * SEEKER SFHSITIVITY= 60. JOULFS/H**2 *	***************************************	

LISTING D-4 SAMPLE OUTPUT FROM COPE (PAGE 10 OF 11)

(PAGE 11 OF 11)

	9	2679(26.79%) 3665(26.90%) 0(0.00%)	986(100.0%) 219(2.19%) 986(77.79%)	26(0.26%) 767(96.61%) 137(1.37%)	741(81.51%) 741(81.51%) 8(0.08%) 604(98.68%)	158(1.58%) 596(73.49%)	O .	236 ****	2.36% 4.14% 6.44% 21.83% .98% = 2484(90.30%)
	50		1277(100.0%) 280(2.80%) 1277(78.07%)	31(0,31%) 997(96,89%)	124(1.544) 966(84.067) 5(0.057) 812(99.387)	211(2.11%) 807(73.85%)	280(2.80%) 596(53.02%)	316	3.16% 5.55% 8.62% 28.28% = 56 KILLED)
10000(99.16%) 9916(98.83%) 9800(100.0%) 9832(84.89%) 8092(79.78%) 6456(88.26%) ***** 5698(91.68%) 5224(97.13%) 5224(89.00%)	4	2008(20.08%) 3665(45.21%)	1657(100.0%) 1657(100.0%) 318(3.18%) 1657(80.81%)	1339(95.67%)	5(0.05%) 1281(82.987) 5(0.05%)	261(2.61%) 1058(75.33%)	384(3.84%) 797(51.82%)	413	4.13% 7.25% 11.27% 13.6.69% PRUBICATINP ENGLOCSN) NUMBER TESTEO (% NOT
PASSED): PASSED): PASSED): PASSED): PASSED): PASSED): PASSED): PASSED): PASSED):	3665) *****	1529(15.29%) 3665(58.28%)	0(0.00%) 2136(100.0%) 357(3.57%) 2136(83.20%)	82(0,82%) 1779(95,39%)	303(3.032) 1697(82.142) 6(0.067) 1394(99.572)	399(3.99%) 1388(71.25%)	504(5.04Z) 989(49.04Z)	485	4.852 8.513 13.233 47.303 64.323 741(2.41x) NU
HUMBER TESTED (Z NUMBER TESTED (Z HUMBER TESTED (Z	***** SHOTS (1058(10.58%) 3665(71.13%)	0(0.00%) 2607(100.0%) 385(3.85%) 2607(85.23%)	75(0,75%)	392(3,92%) 2147(81,74%) 6(0,06%) 1755(99,66%)	502(5.02%) 1749(71.30%)	626(6.26%) 1247(49.80%)	621	21% 96% 73% IC)= 2
84(0.842) 116(1.167) 0(0.007) 268(2.687) 1440(14.407) 1636(16.367) 758(7.587) ***** A) 474(4.747) 150(1.507) 558(5.587) 851(8.517)	1	583(5.83%) 3665(64.09%)	598(5.987) 3082(80.607) 303(3.037) 2484(87.802)	99(0.99%)	358(3,58%) 2082(82,80%) 7(0,07%) 1724(99,59%)	503(5.03%) 1717(70.70%)	636(6.36%) 1214(47.61%)	578	5.782 6 10.147 10 15.157 16 68.2.55 68.2.55 FPERRESINATION FAMILIED LISTING D-4 SAM
DESIGNATOR IN INDIPECT FIRE TARGET BEYOND VISIBILITY RANGE TARGET NOT DETECTED SHOKE KILLER HISSION DUST KILLER HISSION RESIGNATOR BALLER-DUT PRE-COMM PESIGNATOR BALLER-DUT POST-COM LOSSIGNATOR BALLER-OUT POST-COM LOSSIGNATOR BALLER-OUT POST-COM LOS LOST - NO FIRING	POUND NUMBER :	LOS LOST DURING MISSION NUMBER TESTED (3 PASSED)	DESIGNATOR HOT WARNED IN TIME NUMBER TESTED (2 PASSED) OESIGNATUR IN OIRECT FIRE NUMBER TESTED (3 PASSED)	ROUND RELIABILITY FALLURE NUMBER TESTED (* PASSED)	TARGET OBSCURED BY MINI-TERRN NUMBER TESTEO (% PASSED) ROUND DIP HOT ENGAGE TARGET NUMBER TESTFO (% PASSED)	POUND ENGAGED BUT DID NOT HIT HUMBEP TESTED (% PASSED)	ROUND HIT BUT OID NOT KILL NUMBER TESTER (? PASSED)	**** KILLS	FRCB(KILL/OCSH)= PROB(KILL/ATHP EHG)= PROB(KILL/SHOT)= PROB(LOS)= PROB(LOS)= PROB(LOS)= PROB(SHOT/OCSN)= PRO
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CAUSE OF ABORT

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APPENDIX E

NOTATIONAL CONVENTIONS

In chapters 4, 5, and 14 of this report, the content of input cards is sometimes displayed with underlining. This underlining serves only to distinguish that which goes on the card itself from the remainder of the text; no actual underlining is punched on any of the input cards themselves.

Items which are displayed in capital letters (with underlining) in the description of a card type are to be copied literally, letter-for-letter onto the input card of that type. Items displayed in lower case letters represent positions on the card at which substitutions are to be made either from a list of allowed alternatives listed (in capital letters) in the descriptive text or by supplying an appropriate numerical value. In the lists of character strings allowed as substitutions for option words, only the underlined (capital) characters are used.

Similary, in chapter 7 where various messages and error prints are described, the capitalized, underlined part is printed as shown (but without the underlining) whereas the lower case part describes or substitutes for text which may vary from occasion to occasion.

APPENDIX F

GLOSSARY OF ABBREVIATIONS

BCS Battery Computer System

CDC Control Data Corporation

COPE (1) Combat Operational Performance Evaluation

(2) COPPERHEAD Operational Performance Evaluation

DMD Digital Message Device

D.O., DO (1) Designator Operator

(2) DO as in FORTRAN DO-LOOP

DT II Development Test II

FDC Fire Direction Center

GLLD Ground Laser Location Designator

HE High Explosive

IMSL International Mathematical and Statistical Library

LDWSS Laser Designator Weapon System Simulation

LOS Line-of-Sight

LTD Laser Target Designator

MULE Modular Unit Laser Equipment

OT II Operational Test II

PAM Probability of Acquisition and Maneuver

PE Probability of (Seeker) Engagement

PRBLOS Probability of Line-of-Sight

PREPMS Preprocessor of Mass Storage File

TLE Target Location Error

USAFAS US Army Field Artillery School

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- 1. Amoruso, Michael, J., Tice F. DeYoung, Dennis D. Ladd, and Roger D. Schulz, A Comprehensive Digital Flight Simulation of the Cannon Launched Guided Projectile, Rodman Laboratory, Rock Island, IL, January 1977, R-TR-77-007, UNCLASSIFIED report. This report documents a flight simulation model that serves much the same purpose as the LDWSS model. This work was not used in PAM or COPE, but may be of interest to the researcher in this field.
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